

Fire Investigation Summary

Board and Care

Arlington, Washington

April 27, 1998



A fire in a board and care facility claimed the lives of 8 people. This is another fire in this type of occupancy where some of the same common factors are being seen-notably, the lack of a sprinkler system and open doors that allowed the fire to spread to the second floor.



National Fire Protection Association
Fire Investigations Department

On April 27, 1998, a fire occurred in an occupied board and care facility in Arlington, Washington. This fire killed eight of the building's 32 residents.

The facility was a two-story, wood-frame structure that had originally been built as a hospital in 1908. Since that time, it had undergone several renovations and changes in usage. The building was not equipped with an automatic fire sprinkler system. A local fire alarm system was installed with hardwired, AC powered smoke detectors and heat detectors located in the corridors and common areas. Manual pull stations were located adjacent to the exterior exit doors. One audible device was located on each floor.

The upper level had three means of egress: a stairwell on the north end that discharged to the exterior, an exterior door on the south end that led to an exterior handicapped ramp, and an interior stairway in the middle of the floor area that discharged into the corridor on the first floor. This interior stairway had a solid core door that was equipped with an automatic door closer located on a landing between levels. It was determined that at the time of the fire the door was held open by a 10-pound block.

The building was wood frame structure. The interior wall and ceiling finish was either gypsum wallboard or plaster and lathe. The floor finish throughout the building was either linoleum or tile.

Thirty-two residents and two staff members were in the building at the time of the fire. The residents were mentally challenged and had varying degrees of physical handicaps.

At approximately 11:00 p.m., a fire broke out in a first floor room occupied by three woman. The fire was discovered by a staff member who opened the door to the room of origin while she was conducting a routine bed check. She advanced into the room several steps, but the fire was too severe for her to attempt any action. She retreated back into the corridor, leaving the door to the room open. She then yelled out for the other employee, who was in the basement. The second staff member came up to the first floor and observed the fire, which had not yet extended into the corridor.

The second staff member then proceeded up to the second floor to begin evacuating the residents on that level. She reported that at approximately this time the fire alarm, which was a local system, began to sound.

Assisted by a female resident, she began to wake the residents on the second floor.

The fire extended from the room of origin, through the open door, into the first floor corridor. Immediately adjacent to this room was the interior stairway between the first and second floors. The fire then extended up this

stairway, to the second floor. The door had been blocked open and did not impede the movement of the smoke and fire to the second level.

The Arlington Fire Department was notified of the fire when the staff member who discovered the fire called 911. The fire fighters responded from a station located 1/2 mile (0.8 km) away. Upon arrival, they extended a hoseline in the north entrance to the room of origin and extinguished the fire with approximately 200 gallons (750 L) of water.



Room of Origin. It was determined that the fire started in the bed.

Eight residents were killed-the three occupants in the room of origin, three women in a second floor bedroom that was directly opposite the interior stairway that served as a path of travel for the fire, and two women who were found in a second-floor bathroom adjacent to the interior stairway.

At least one of the women in the second-floor bedroom who was killed had stopped to begin getting dressed. The two women found in the bathroom had been in their room on the north end of the floor, immediately adjacent to an exit stairway. Apparently, they were attempting to travel south to the handicapped ramp to exit the building when they either became disoriented or attempted to take refuge in the bathroom, where they subsequently were killed.

The fire was determined by the Snohomish Fire Marshal's office to be incendiary in nature. The area of origin was a bed in the first floor room where it is believed that the resident ignited her bedding material using either a lighter or matches.

Based on the NFPA's investigation and analysis of this fire, the following significant factors are considered as having contributed to the loss of life and property in this incident:

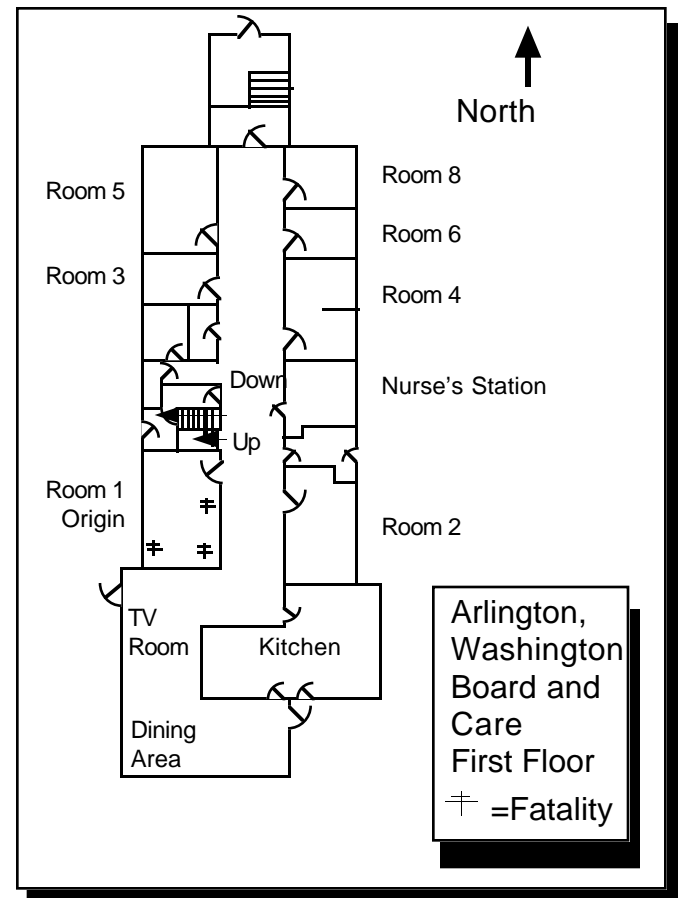
- Ignition of bedding material
- Lack of an automatic fire sprinkler system
- Lack of system smoke detectors in the room of origin
- An open door to the room of origin that allowed the fire to spread into the corridor
- An open fire door that allowed the fire to spread from the first floor to the second floor
- An open door on the second-floor bedroom that was directly in the line with the stairway where the fire extended to the second floor
- Failure of two second-floor residents to use the exit stairway immediately adjacent to their room
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- An open door on the second-floor bedroom that was directly in the line with the stairway where the fire extended to the second floor
- Failure of two second-floor residents to use the exit stairway immediately adjacent to their room

Abstracts from these incidents are including in an appendix to this report. Copies of the full reports can be ordered from the NFPA Library.

This fire is the seventh fatal board and care fire investigated by NFPA since December, 1984. These seven incidents have resulted in a total of 50 fatalities over a period of 3-1/2 years. The other six incidents include:

Broward County, FL	5 Fatalities
Mississauga, Ontario	8 fatalities
Laurinburg, North Carolina	8 fatalities
Shelby County, Tennessee	4 fatalities
Ste. Genevieve, Quebec	7 fatalities
Harveys Lake, Pennsylvania	10 fatalities



Fire Investigation Summary

Board and Care Fire

**Arlington,
Washington
April 27, 1998**

The National Fire Protection Association's Fire Investigations Department documents some of the most significant fires and incidents throughout the world. The objective of these investigations is to determine what lessons can be learned from these incidents. This information is then made available to the fire safety community to be used in developing future codes and standards. A complete listing of reports is available, either upon request or can be viewed on our web page.

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BOARD AND CARE
ARLINGTON, WASHINGTON
APRIL 27, 1998

Board and Care

Arlington, Washington
April 27, 1998

8 Fatalities

Prepared by

Ed Comeau

Chief Fire Investigator
National Fire Protection Association

ABSTRACT

On April 27, 1998, a fire occurred in an occupied board and care facility in Arlington, Washington. This fire killed eight of the building's 32 residents.

The facility was a two-story, wood-frame structure that had originally been built as a hospital in 1908. Since that time, it had undergone several renovations and changes in usage. The building was not equipped with an automatic fire sprinkler system. A local fire alarm system was installed with hardwired, AC powered smoke detectors and heat detectors located in the corridors and common areas. Manual pull stations were located adjacent to the exterior exit doors. One audible device was located on each floor.

The upper level had two means of egress: a stairwell on the north end that discharged to the exterior, and an exterior door on the south end that led to an exterior handicapped ramp. An interior stairway in the middle of the floor area discharged into the corridor on the first floor. This interior stairway had a solid core door that was equipped with an automatic door closer located on a landing between levels. It was determined that at the time of the fire the door was held open by a 10-pound block. This stairway would be more appropriately classified as a convenience stair since it did not meet the requirements for exit enclosure or vertical opening protection.

The building was wood frame structure. The interior wall and ceiling finish was either gypsum wallboard or plaster and lathe. The floor finish throughout the building was either linoleum or tile.

Thirty-two residents and two staff members were in the building at the time of the fire. The residents were mentally challenged and had varying degrees of physical handicaps.

At approximately 11:00 p.m., a fire broke out in a first floor room occupied by three woman. The fire was discovered by a staff member who opened the door to the room of origin while she was conducting a routine bed check. She advanced into the room several steps, but the fire was too severe for her to attempt any action. She retreated back into the corridor, leaving the door to the room open. She then yelled out for the

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other employee, who was in the basement. The second staff member came up to the first floor and observed the fire, which had not yet extended into the corridor.

The second staff member then proceeded up to the second floor to begin evacuating the residents on that level. She reported that at approximately this time the fire alarm, which was a local system, began to sound. Assisted by a female resident, she began to wake the residents on the second floor.

The fire extended from the room of origin, through the open door, into the first floor corridor. Immediately adjacent to this room was the interior stairway between the first and second floors. The fire then extended up this stairway, to the second floor. The door had been blocked open, which allowed the movement of the smoke and fire to the second level.

The Arlington Fire Department was notified of the fire when the staff member who discovered the fire called 911. The fire fighters responded from a station located 1/2 mile (0.8 km) away. Upon arrival, they extended a hoseline in the north entrance to the room of origin and extinguished the fire with approximately 200 gallons (750 L) of water.

Eight residents were killed—three occupants in the room of origin, three women in a second floor bedroom that was directly opposite the interior stairway that served as a path of travel for the fire, and two women who were found in a second-floor bathroom adjacent to the interior stairway.

At least one of the women in the second-floor bedroom who was killed had stopped to begin getting dressed. The two women found in the bathroom had been in their room on the north end of the floor, immediately adjacent to an exit stairway. Apparently, they were attempting to travel south to the handicapped ramp to exit the building when they either became disoriented or attempted to take refuge in the bathroom, where they subsequently were killed.

The fire was determined by the Snohomish Fire Marshal's office to be incendiary in nature. The area of origin was a bed in the first floor room where it is believed that the resident ignited her bedding material using either a lighter or matches.

Based on the NFPA's investigation and analysis of this fire, the following significant factors are considered as having contributed to the loss of life and property in this incident:

- Ignition of bedding material
- Lack of an automatic fire sprinkler system
- Lack of system smoke detectors in the room of origin
- An open door to the room of origin that allowed the fire to spread into the corridor
- An open fire door that allowed the fire to spread from the first floor to the second floor
- An open door on the second-floor bedroom that was directly in the line with the stairway where the fire extended to the second floor
- Failure of two second-floor residents to use the exit stairway immediately adjacent to their room

This fire is the seventh fatal board and care fire investigated by NFPA since December, 1984. These seven incidents have resulted in a total of 50 fatalities over a period of 3-1/2 years. The other six incidents include:

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CONTENTS

	Page
I. Introduction	7
II. Background	
Occupancy Classification	9
The Building	9
Furnishings	11
Fire Protection Systems	11
Means of Egress	13
Building Occupants	17
Staff Training	17
Weather	18
III. The Fire	
Discovery and Occupant Activities	19
Fire Department Notification and Response	20
Casualties	22
Damage	24
IV. Timeline	27
V. Analysis	
Cause and Origin	29
Fire Growth and Spread	29
VI. Discussion	33
VII. Conclusion	39
Appendix A	41
Abstracts from Related NFPA Fire Investigation Reports	

I. INTRODUCTION

The National Fire Protection Association (NFPA) investigated the Arlington, Washington, Board and Care Fire in order to document and analyze significant factors that resulted in the loss of life and property.

The investigation was conducted by the NFPA as part of its ongoing program to investigate technically significant incidents. The NFPA's Fire Investigation Department documents and analyzes incident details so that it may report lessons learned for life safety and property loss prevention purposes.

The NFPA became aware of the fire on the day it occurred, and Edward Comeau, Chief Fire Investigator of the NFPA Fire Investigations Department, visited Arlington, Washington to perform an on-site study of this incident. That three-day, on-site study, documentation and analysis of the event are the basis for this report. Entry to the fire scene and data collection activities were made possible through the cooperation of the Arlington Fire Department.

This report is another of the NFPA's studies of fires having particular important educational or technical interest. All information and details regarding fire safety conditions are based on the best available data and observations made during the on-site data collection phase and on any additional information provided during the report development process. It is not the NFPA's intention that this report pass judgment on, or fix liability for, the loss of life or property resulting from the Arlington Board and Care fire. Rather, the NFPA intends that its report present the findings of the NFPA data collection and analysis effort and highlight factors that contributed to the loss of life or property.

Current codes and standards were used as criteria for this analysis so that conditions at the building on the day of the fire could be compared with state-of-the-art fire protection practices. It is recognized, however, that these codes and standards may not have been in effect during construction or operation of the facility. The NFPA has not analyzed the building regarding its compliance with the codes and standards that were in existence when it was built or during its operation.

The cooperation and assistance of the Arlington Fire Department, the Snohomish County Fire Marshals Office and the Washington State Fire Marshal's Office is greatly appreciated.

II. BACKGROUND

OCCUPANCY CLASSIFICATION

Per NFPA 101®, *Life Safety Code*®, this facility would have been classified as a large board and care facility.

THE BUILDING

The building was a two-story, wood-frame structure that had been originally built as a hospital in 1908. The hospital vacated the building in the late 1950's, and in the early 1960's the building was converted to a nursing home. In 1979 it was converted and licensed as a board and care facility. The building measured approximately 130 feet by 36 feet (40 m by 11 m).



Photo 1. The southeast corner of the facility.

Structural support was provided by 2-in. x 6-in. wooden studs on both the exterior walls and interior partitions.

The interior wall and ceiling finish was comprised of either plaster and lathe or gypsum wallboard attached directly to the studs or joists. In the corridor on the first floor, 12-in. x 12-in. x 1/2-in. (305-mm x 305-mm x 13-mm) tiles were adhered to the

gypsum by mastic. It appeared that these tiles were not combustible, but that the mastic failed during the fire, causing them to fall.

The floor finish was either linoleum or 12-in. x 12-in. (305-mm x 305-mm) tiles.

There were handrails provided to assist the residents in moving down the corridors.

The corridors measured 7 ft (2.1 m) wide. No obstructions or storage was observed in the corridors.

According to NFPA 220, *Standard on Types of Building Construction* 1995 edition, this structure would be of Type V (000) construction with a fully sheathed interior of either lath and plaster or gypsum wallboard.

Each of the bedrooms was equipped with a 44-in. (1,118-mm) wide, solid core wood door. The frames that they were set in were also wood. There were no automatic door closures. The hardware was conventional knob-style, non-locking, latching hardware. No fire rating labels were found on the doors or door frames.

There was a basement under a portion of the building. This area contained the boiler for the heating system, the hot water heater, an emergency generator, and a clothes washer and dryer.

Power to the building was provided via an aboveground service connection. An emergency generator that was powered by natural gas was located in the basement. However, this generator was inoperable.

The building was supplied with natural gas.

Heating for the building was provided by a natural gas fueled boiler in the basement that circulated hot water through a radiator system.

A Type V (000) structure will have a 0-hour fire resistance rating for the exterior bearing walls (first digit); a 0-hour fire resistance rating for structural frame or columns and girders supporting loads for more than one story (second digit); and a 0-hour fire resistance rating for the upper story assembly (third digit).

FURNISHINGS

The furnishings in the resident's rooms varied. The beds were metal frames and a mattress. There were no box springs on the beds. Clothing was hung in open-faced wardrobes. A variety of upholstered easy chairs were observed. Bedside tables were made of combustible materials.

The furnishings in the kitchen area on the first floor and in the common area on the second floor were metal-framed chairs with upholstered seats and backs. The tables were constructed of metal frames with Formica tops.

The television area on the first floor was furnished with upholstered easy chairs.

FIRE PROTECTION SYSTEMS

Suppression Systems

The building was not equipped with a fire sprinkler system or a standpipe system.

Fire Extinguishers

There were 2-1/2-gal (9.5-L), pressurized water fire extinguishers located in the corridors.

Fire Alarm

The building was equipped with a fire alarm system comprised of the following devices:

- Hardwired system smoke detectors in the corridors, basement and common areas
- Hardwired system heat detectors in the corridors, common areas, basement, and kitchen
- Manual pull stations
- Audible devices in the corridors

No single station smoke detectors were observed in the individual sleeping rooms.

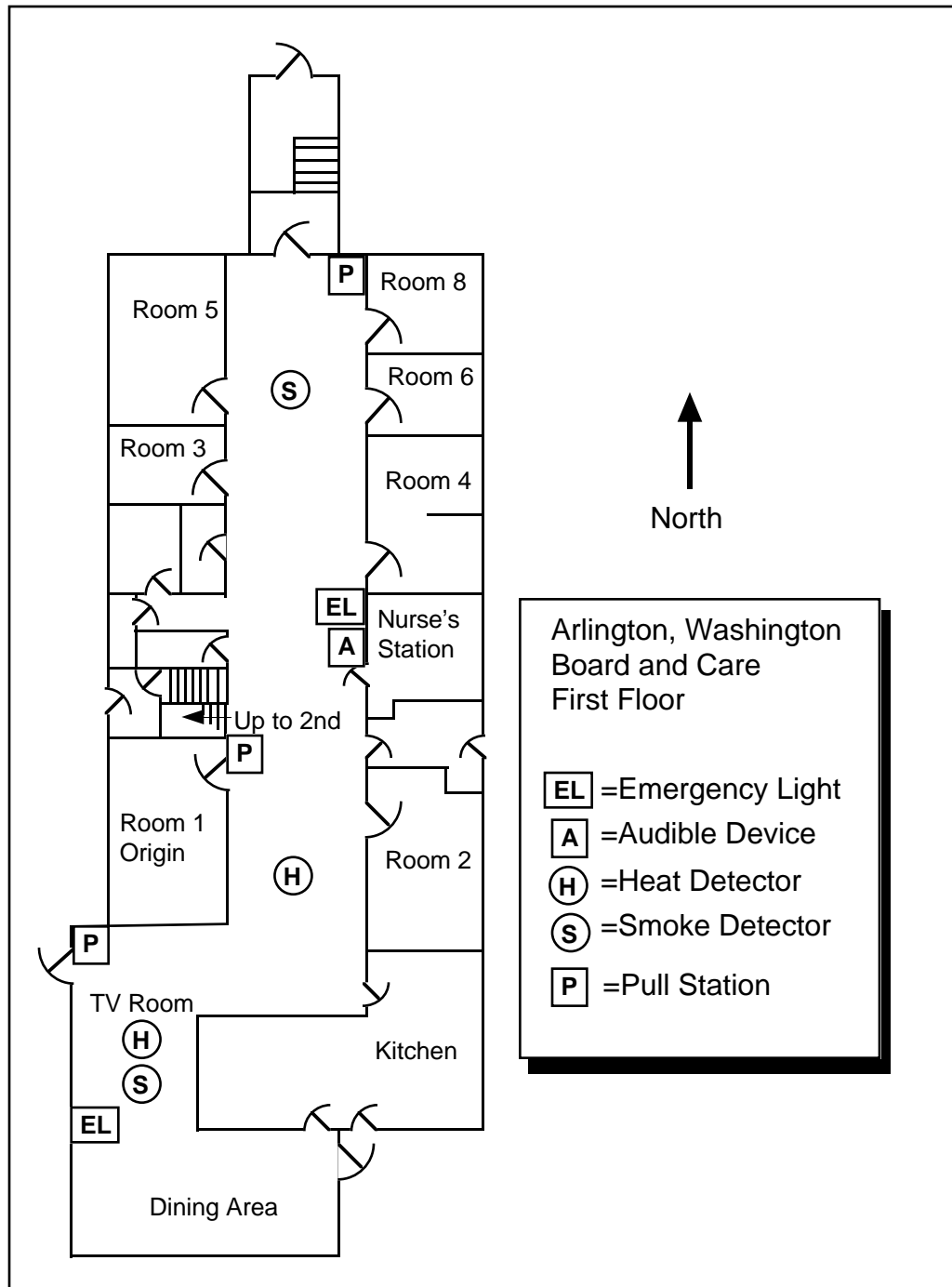


Figure 1. Location of fire protection/detection equipment on the first floor.

When the alarm system was activated, it would sound an alarm on all three levels of the building. No alarm signals were transmitted off premises.

No visible notification appliances were connected to the alarm system, despite the fact that several residents were either completely deaf or hard of hearing.

Several staff members reported that there had been a history of nuisance alarms in the recent months. The frequency of these alarms could not be verified.

MEANS OF EGRESS

Second level. There were three means of egress from the second level.

North end. A 4-ft (1.2-m) wide stairway passed from the north end of the corridor down to the first level where a door allowed the occupants to discharge directly to the exterior of the building. This stairway was separated from the corridors on the two levels by a 44-in. (1,118-mm) solid core door that was equipped with panic hardware and automatic door closures. None of the doors on the north stairwell were equipped with any type of alarm that would sound when the door was opened (it was reported that the staff and residents believed the doors were alarmed). Both interior doors and the exterior door were operable at the time of the fire and were in a closed position. Some combustible materials were stored on the landing on the second level. According to staff members, this stairway was not routinely used by the residents to move between floors.

South end. A 44-in. (1,118-mm) solid core door in the common area on the south end led to an exterior handicapped ramp that would allow the occupants to travel down to the ground level. This door was operable at the time of the fire. The staff reported that this door was frequently used by the residents.

Interior convenience stairway. A 48-in. (1,118-mm) wide stairway, located midway in the building, connected the first and second levels. A solid core, 44-in. (1,118-mm) door was located on a landing midway between the two levels. This door was equipped with panic hardware and an automatic door closer. At the time of the fire this door was held open by a 10-pound (4.5-kg) object. (NOTE: This stairway, while serving as a means to move between floors, should be classified as a “convenience stair” and not as a “means of egress” because it did not fully meet the requirements in NFPPFA documents for separation and protection.)



Photo 2. The door on the landing for the central stairway had been propped open at the time of the fire.

First Floor The first floor had six doors that led to the exterior of the building. Not all of them would have been classified as acceptable means of egress.

North end. The occupants could exit from the building via a door at the north end of the corridor, down several steps, and then through a door that discharged directly to the exterior of the building. These doors were in a closed position at the time of the fire and were operable. Both the interior and exterior doors were 44-in. (1,118-mm) wide and were equipped with panic hardware and automatic door closures. There was some storage in the stairway landing on the first level.

East side. A 36-in. (914-mm) wide door was located on the east side of the building. The occupants would be required to travel through a small room to gain access to this door, which swung inward. The door was equipped with a slide bolt on the inside and it was not equipped with panic hardware. This door was not identified as a means of egress from the interior of the building and would not have been an acceptable means of egress from the building.

Southeast corner. There were two doors in this area. One 36 in. (914-mm) door, which swung inwards, served the kitchen area and was not identified as a means of egress. This door discharged onto a landing.

The second door also discharged onto the same landing and provided egress from the common area/dining area on the south end of the building. This 36-in. (914-mm) wide door was equipped with an automatic door closer and panic hardware. The door did swing in the direction of travel from the building.

West side, southern portion. A 44-in. (1,118-mm) wide door provided egress from an interior area where the south end of the corridor intersected with the TV room. This door was equipped with panic hardware and an automatic door closer. This door was operable at the time of the fire and did swing in the direction of egress travel.

West side, northern portion. A 32-in. (813-mm) wide door was located in a stairway on the west side of the building. This door swung inward, was equipped with a slide bolt and was operable at the time of the fire. It was not equipped with panic hardware or an automatic door closer. This interior stairway provided a travel path between the basement and the first floor. The 42-in. (1,067-mm) wide stairway required that the occupants travel down several steps to gain access to the door. At the top of these steps was a gate designed to deter movement through this stairway. This route was not identified as an exit and would not have been considered an acceptable means of egress.

Second Level

There were three routes through which occupants of the second floor could travel.

Interior Convenience Stairway. This stairway was located halfway down the length of the building and connected the first and second stories. It measured 42-in. (1,067-mm) in width and had return landing midway where a 32-in. (813-mm) door was located. This door swung in the direction of travel from the upper level, downward and was equipped with an automatic door closer and panic hardware. At the time of the fire, this door was propped open. According to some of the staff, it was very common for this door to be held open. There was not evidence of fire rating labels on either the door or the metal door frame.

North Stairway. A stairway at the north end of the building provided a travel path from the second floor, down to the exterior of the building. This stairway measured 48-in. (1,219-mm) in width. A door, equipped with an automatic door closer and panic hardware, separated the stairway from the second level. There was no evidence of any fire rating labels on the door or the metal door frame. The door was in the closed position at the time of the fire.

South Exit Ramp A ramp at the southeast corner of the building provided a travel path from the second level to the ground. Access to the ramp was through an exterior door that measured 44-in. (1,118-mm) in width. Constructed of combustible material, this ramp was the primary exit route used by the residents on the second floor during the fire.



Photo 3. This ramp provided an exit path from the second floor.

BUILDING OCCUPANTS

The building was occupied by thirty-two residents and two staff members at the time of the fire. The residents were mentally challenged to varying levels. Several also suffered from a variety of mobility impairments that required the use of walkers, canes, or wheelchairs. According to several staff members, all of the residents were capable of moving independently if necessary.

The facility had defined areas where smoking was permitted. No smoking was allowed in the individual bedrooms. The only area where smoking was permitted inside of the building was in the common area on the south end of the first floor. Residents and staff were also allowed to smoke outside of the building.

With the exception of a female resident in the room where the fire started and a male resident, none of the residents were allowed to possess cigarettes, matches or lighters. There were specific times that they were allowed to smoke, and at those times the staff would give the residents a cigarette and light it for them.

STAFF TRAINING

According to some staff members, fire drills were conducted several times a year. One reported that they were conducted monthly. It was reported that the fire alarm system would be actuated during these drills and the residents would be directed to move out of the building. One staff member reported that when on duty, she would always direct the residents to evacuate the second floor from the south door and down the handicapped ramp. The residents were not trained in using alternative exits if their primary route was obstructed.

Another staff member reported that when on duty, she would have residents on the first floor use alternative routes out of the building, depending upon which room they simulated as being on fire.

The employees interviewed by NFPA reported that they did not receive training in fire safety from the facility management. However, official investigators reported that all employees received regular training. Fire drills were held monthly, and the training focused on isolating the fire and calling 911.

WEATHER

The National Weather Service at Arlington Airport reported that the weather on April 27, 1998, at 10:00 p.m. was cloudy with overcast at 12,000 ft. The temperature was 54°F (12°C), the dew point 39°F (4°C). The relative humidity was 58%. Winds were from the west-northwest at 4 mph (6 k/hr).

III. THE FIRE

DISCOVERY AND OCCUPANT ACTIVITIES

At approximately 10:45 p.m., a staff member who was finishing her shift conducted a bed check. She reported that when she opened the door to Room 1 she did not observe any abnormalities. She closed the door to this room, continued her bed check, and then was relieved at 11:00 p.m.

At some time between 11:00 p.m. and 11:09 p.m., an oncoming staff member opened the door to Room 1 to conduct a bed check. Upon opening the door she immediately observed a wall of flame inside the room, extending the width of the room from west to east. She walked several steps, or approximately 4 ft (1.2 m), into the room and was able to see that the woman in the bed immediately to the left of the door was on fire. She reported that the fire was burning very intensely and that there was not very much smoke. She backed out of the room, leaving the door open, and began shouting for her co-worker. At the same time, she reported, she could hear one of the occupants in one of the other beds in the room of origin begin banging on the wall and shouting for help.

The second staff member was in the basement at the time. She came upstairs immediately and observed the first staff member standing in the corridor, looking into the room of origin. A male resident was standing next to the first staff member with a pressurized water fire extinguisher. (There are conflicting reports on the exact time this male resident arrived; other reports indicated that he arrived after the second staff member went to the second floor.) When the second staff member looked into the room, she also observed fire burning very intensely, with very little smoke production. She reported that the fire had not yet extended into the corridor. The fire, however, was too intense for any attempts at either rescue or suppression using the fire extinguisher.

The second staff member proceeded to the second floor to begin evacuating the residents on that level. Either as she was leaving the first floor, or while traveling to the second level, she reported that she believes the fire alarm system activated.

The first staff member dialed 911 from a telephone located in a nurse's station diagonally across the hall from Room 1 at 11:09 p.m. to report the fire.

The staff member on the second floor began waking the residents and alerting them to the fire. A female resident assisted her. The staff member woke residents on the south end, and the female resident woke residents on the north end. The occupants were being directed to evacuate from the building via the door at the south end of the building.

FIRE DEPARTMENT NOTIFICATION AND RESPONSE

At 11:09 the Arlington Public Safety Answer Point (PSAP) received a telephone call from one of the staff members at the facility reporting the fire. Six units were immediately dispatched, some from the station located approximately 1/2 mi (0.8 km) away. The medic unit was dispatched from the Cascade Hospital.

The first unit arrived on the scene at 11:14 p.m. This unit, a medic unit, reported fire showing from the west side and requested a second alarm.

The personnel from this unit attempted to make entry into the building, but were not able to penetrate very far because they were not equipped with any protective clothing or breathing apparatus. After they retreated they began to establish a triage and treatment area for the residents that had been evacuated.

Engine 46 arrived on the scene shortly after the medic unit and positioned itself on the north end of the building. Crew members advanced a preconnected 1-3/4-in. (44-mm) line through the north door, down the corridor to the room of origin. While advancing the line they reported that the smoke was completely obscuring their vision. As they neared the room of origin they observed fire at the ceiling level. The fire fighter on the nozzle discharged short bursts of water at the fire at the ceiling level, and it immediately darkened down. They continued to advance until they reached the room of origin, where they suppressed the fire.

According to the pump operator, the interior attack crew suppressed the fire before he was able to have a water supply established. He estimated that the fire was suppressed using approximately 200 gal (750 L) of tank water.



Photo 4. Southwest view of the facility. Although the fire vented out the exterior window on the first floor, there was not any significant fire spread to the second floor from the exterior of the building.

Additional crews arrived on the scene to assist in the rescue operations. Most of the residents had evacuated the building by this time and were being directed to the treatment and triage area. Some crews were assigned to this sector to assist in the treatment and transportation. A nurse, the wife of a fire fighter, began a patient tracking system that was continued by a medic unit that arrived on the scene later.

Additional handlines were advanced from Engine 46 to the east side of the structure. A 35 ft (11 m) ground ladder was placed on this side, and a handline was advanced into the interior. Personnel also made entry into the second floor via the handicapped ramp on the south side of the building.

Primary and secondary searches were conducted of the first and second floors. Five female occupants were removed from the second floor. All five subsequently died.

A total of 23 patients were transported by ambulance. Two critical patients were airlifted to Harborview Medical Center in Seattle.

CASUALTIES

Eight female residents died in this fire. Three of those fatalities were located in the room of origin. All three residents died from exposure to the fire.

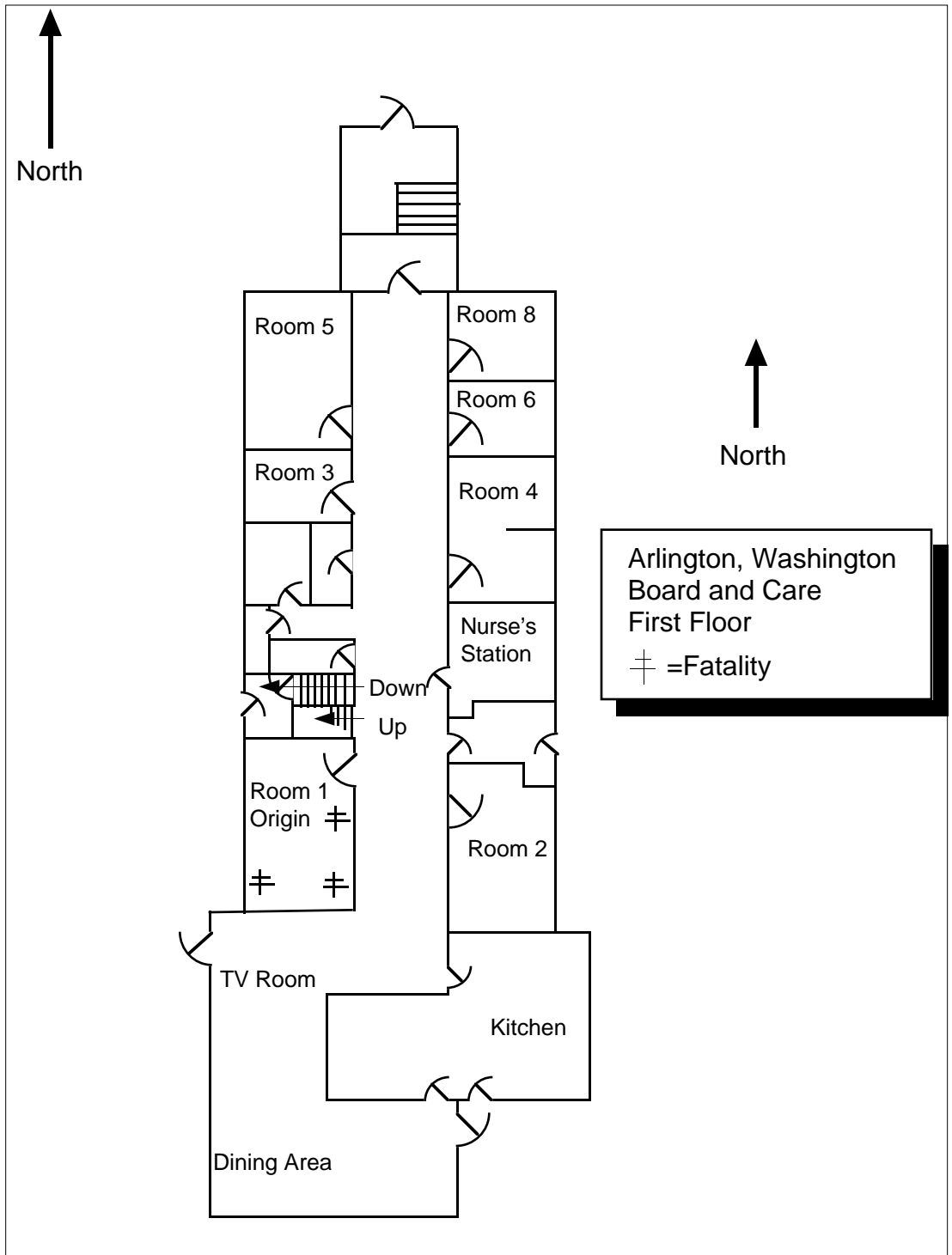


Figure 2. Location of fatalities on the first floor.

Another three residents were located in the second floor room that was directly in line with the interior stairway and received the brunt of the fire that traveled up through the stairway.

The final two residents were found in the bathroom immediately adjacent to the interior stairway. These two residents were in Room 11 at the time of the fire and walked down the hall to the south, towards the fire, instead of using the exit stairwell adjacent to their room. All five of these residents on the second floor died from smoke inhalation.



Photo 5. The bathroom where two residents died on the second floor was next to the central stairway that was the main avenue of fire spread to the second floor.

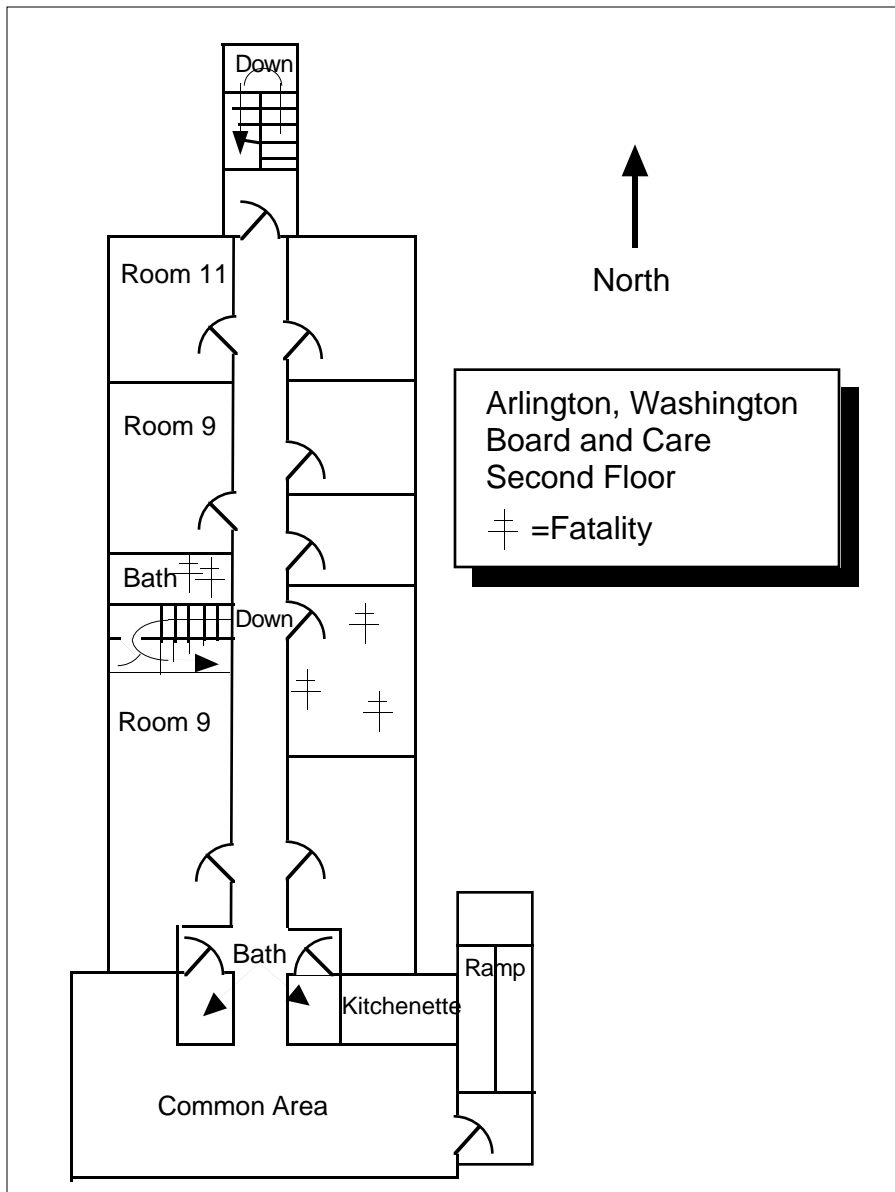


Figure 3. Location of fatalities on the second floor.

Twenty-three people were treated and released for smoke inhalation.

DAMAGE

The room of origin and its contents were completely destroyed by the fire. The corridor outside the room and the interior stairway was also severely damaged by the fire.



Photo 6. The contents of the room of origin were severely damaged by the fire.

The corridor on the second floor was also damaged by the fire. There were varying degrees of smoke damage throughout the facility. There was minimal water damage.

IV. TIMELINE

4/27/98

- 11:10 Time of call.
- 11:10 Engine 47, 46, 46AS, Rescue 46, AC47, A49 dispatched. M49 also responded.
- 11:14 Medic 49 on the scene. Requesting second alarm.
- 11:15 A49 on the scene reporting multiple patients trapped.
- 11:17 Engine 46 on the scene, laying a supply line.
- 11:17 Third alarm requested.
- 11:23 Ladder 47 on the scene.
- 11:25 Engine 49 on the scene.
- 11:26 Engine 49A on the scene.
- 11:30 Deputy Chief 46 on the scene.
- 11:40 A46, E46A, E47 on the scene.
- 11:41 R46, U46, AC47 on the scene.
- 11:41 EMS Strike Team Assembly area is Station 43.
- 11:50 Two patients airlifted to Arlington Hospital.
- 11:52 Reported that there are 15 green patients, 4 yellow patients, 2 red patients.
- 11:55 One patient airlifted to Cascade Hospital.
- 11:56 Secondary search complete.

4/28/98

- 1:28 Twenty-three patients reported transported .

V. ANALYSIS

CAUSE AND ORIGIN

According to the Snohomish County Fire Marshal's office, the fire originated in the area of the bed located along the east wall of Room 1. The cause was determined to be incendiary "by use of a handheld flame" by one of the female residents who died in the fire in Room 1.



Photo 7. The fire was believed to have started in the area of this bed in Room 1 on the first floor.

FIRE GROWTH AND SPREAD

Once the bedding material was ignited, other objects in the room were ignited very rapidly, including the clothing hanging in an open wardrobe facing the fire, the wardrobe itself, and other combustible furnishings within the room.

When the staff member opened the door shortly after 11:00 p.m., she reported that the fire was burning very intensely, but that there was little smoke development. This

statement was reinforced by the observations of the second staff member who observed the fire.

After detecting the fire, the staff member left the door to the room of origin open, allowing the fire to extend into the corridor. The stairway immediately adjacent to the room of origin provided a path for vertical fire spread. Because the door on the mid-landing in this stairway was propped open, the smoke and fire was able to spread upward, unimpeded.



Photo 8. The central stairway was immediately adjacent to the room of origin on the first floor. This stairway was the primary avenue of fire spread to the second floor.

The smoke and fire then extended upward to the corridor on the second floor, igniting material in that area. The room across from the open stairway was in the direct line of attack from the fire. This room did not suffer significant fire damage. However, smoke was able to spread unimpeded into this room, killing three of the occupants.



Photo 9. The room on the second floor (seen in these two photographs) where three women died was directly across from the central stairway. This room was not severely damaged by the fire.



Photo 10.



Photo 11. The common room at the south end of the building on the second floor was damaged by the spread of heat and smoke.

VI. DISCUSSION

A number of factors contributed to the loss of life in this facility.

Open doors. Three separate doors were in the open position, allowing the smoke and fire to spread beyond the room of origin. The first was the door to the room of origin. If this door had been closed following detection of the fire, the fire might have been confined to this room and not endangered any of the occupants outside of this area. This door was not equipped with an automatic closer.

The second door that could have limited the fire spread was in the stairway adjacent to the room of origin. The door on the landing was equipped with an automatic closer but was propped open. It is critically important to stop the fire from spreading upward-if this door had not been propped open, the fire spread could have been limited to the first floor.



Photo 12. The door leading to the second floor from the central stairway was propped open at the time of the fire.

The third door in the open position was the one on the bedroom at the top of the interior stairway. The three residents in this room died from smoke exposure. If this door had been closed, the spread of smoke into this room could have been reduced,

improving their chances of surviving the fire, given the rapid response by the fire department and the quick suppression.

In a number of fires investigated by NFPA, open doors have been significant contributing factors to the loss of life. A closed door can serve as a critical barrier to the spread of smoke and fire, and improve the chances of survival.

Resident Training Two residents of Room 11 on the second floor did not elect to use the stairway immediately adjacent to their room to evacuate the building. Instead, they traveled south down the corridor, presumably heading towards the south door as directed by the staff member. This path took them directly towards the fire instead of away from it.

It was also reported that at least one of the people on the second floor who died was wearing clothing. It appears that she was taking the time to get dressed after being awakened, rather than immediately evacuating the room.

All of the staff members who were interviewed indicated that they would have expected the people who died to be those with the likeliest probability to live. These were the residents with higher cognitive levels, and it was felt that they would have reacted appropriately to a fire situation. It would appear that this was not the case, and that they performed several inappropriate actions, such as not using the closest egress route and delaying their escape in order to dress. Such actions, in this case, were fatal.

Sprinklers A properly designed, installed, and maintained sprinkler system would have been pivotal in changing the outcome of this incident. The effectiveness of a sprinkler system in controlling a fire and reducing the potential for life loss is well documented. Sprinklers can provide a level of life safety that can contend with some of these factors. Their effectiveness is unquestionable. A report published by NFPA's Fire Analysis Division on the U.S. experience with fire sprinklers states: "When sprinklers are present, the chances of dying in a fire and the average property loss per fire are both cut by one half to two thirds, compared to fires where sprinklers are not present."¹

¹ *US Experience with Sprinklers: Who has them? How well do they work?* Kimberly D. Rohr, September 1997

Fire detection It would appear that the fire was detected shortly after ignition. The fire marshal reported that the fire was not a slow, smoldering fire, so detection was probably not significantly delayed. The existence of a smoke detector in the room of origin would probably not have played a significant role in decreasing the detection time.

However, a smoke detector would have automatically activated the fire alarm system earlier, alerting the other occupants in the building to the fire earlier. Anything that can be done to reduce the amount of time for required for occupants to be reacting to a fire improves their odds for surviving a fire.

Furthermore, if the fire alarm system had automatically transmitted an alarm to the fire department, they would have been able to initiate a response earlier and therefore begin suppression operations quicker. Considering the fact that this was not a relatively big fire, and that the main body of the fire in the room of origin was suppressed with only 200 gallons of water, the fire did not have time to grow to large proportions.

Resident Actions At least three of the residents took inappropriate actions which contributed to their deaths. After being awakened, one resident stopped to get dressed instead of immediately attempting to escape. This delay proved to be fatal. It is imperative that once a fire is detected, steps be taken to get out of the building immediately.

Two other residents were in their room at the north end of the building, next to the exit stairwell. Instead of using this stairwell, they apparently elected to head through the corridor toward the south exit, taking them further into danger instead of away from it. It was theorized that they may have done this because a staff member was directing the occupants in this direction, and because they may have been trained during fire drills to use this route instead of evaluating conditions and then selecting the safest and quickest route possible.

This fire is the seventh board and care fire that NFPA has investigated within a 3-1/2 year period. These seven fires have resulted in 50 fatalities. Over a period of 27 years, since 1971, there have been 64 fires, killing 296 people.

Incident	Cause	Sprinkler	Alarm in Rooms	Staffing	Door	Time of fire	Occupants	Deaths
Broward	Smoking	No	No	1	Open	Night	Mentally Challenged	5
Laurinburg	Electrical	No	Heat	3	Open	Evening		8
Shelby	Smoking	No	No	Unk.	Open	Night	Elderly	4
Mississauga	Smoking	No	No	Unk.	Open	Evening	Elderly	8
Ste. Genevieve	Smoking	No	Heat	8	Open	Mid-day	Elderly	7
Harveys Lake	Smoking	No	No	1	Open	Evening	Elderly and Mentally Challenged	10
Arlington	Incendiary	No	No	2	Open	Night	Elderly and Mentally Challenged	8

Table 1.

Based on information from the U.S. Census Bureau, the size of the elderly population will peak in the period 2010 to 2030 due to the baby boom. A logical extension might be that the number of board and care facilities will also expand to accommodate this larger aging population.

A 1995 study commissioned by the Office of the Assistant Secretary for Planning and Evaluation, the Administration on Aging and the Health Care Financing Administration, estimated that there were 34,000 licensed board and care facilities in the United States with 613,000 beds.

Some interesting findings emerged from this report:

- The average resident is significantly older and more disabled than a decade ago.
- While the perception is that board and care consists of small, private, family homes, most residents live in fairly large facilities; the majority live in facilities with more than 50 beds.

The study went on to state that “study findings point to a board and care population that is considerably older and more frail and disabled than it was a decade ago. Also, the mix of physically frail elderly, cognitively impaired elderly, and residents with mental illness and developmental disabilities, some of whom are nonelderly, presents a complex caregiving challenge.”²

These points raise concern about the current level of fire protection that is being called for in these occupancies.

² *Executive Summary, Analysis of the Effect of Regulation on the Quality of Care in Board and Care Homes*, p. 38, Hawes, et. al., July 10, 1995 (url: <http://aspe.os.dhhs.gov/daltcp/resident/care.pdf>)

VII. CONCLUSION

Presently, the data is insufficient to conclude that there is an upward trend developing in fatal board and care fires. However, based on data from the U.S. Census bureau and assisted living organizations, it is likely that there will be a future growth in the number of these types of facilities. It is a logical conclusion that if there are increasing numbers of these facilities housing more people, the chances of a fire occurring are greater.

The elderly are at a much higher risk from fire, according to information from the NFPA Fire Analysis Division. "Home fire death rates were nearly twice the national average for adults age 65 and older, two and two-thirds the national average for adults age 75 and older, and more than four times the national average for adults age 85 and older."³ This is so graphically demonstrated by the fires that NFPA has documented in recent board and care facilities.

The risk, however, is not limited to these types of facilities. A recent fire in a St. Louis high-rise building housing elderly residents spread upward from the apartment of origin to the two floors above it. This fire was accelerated by exploding oxygen cylinders in the apartment. One of the cylinders, when it exploded, rocketed against the adjoining wall to the next apartment, causing it to move and allowing smoke to spread into the apartment where an occupant was trapped. Fortunately, none of the residents were killed or seriously injured during this fire. However, a fire fighter was critically injured while trying to rescue the trapped resident.

Another fire in an elderly high-rise in Raleigh, North Carolina resulted in the deaths of two of the residents. As in the fire in St. Louis, this fire also involved exploding oxygen cylinders.

There are a number of common factors in all of these fires-smoking materials, open doors and a lack of sprinkler systems. The first two are human behaviors that can be modified, but with how much success? We must start to develop strategies to implement in buildings housing our nation's elderly that will provide them with enough safety from fire.

³ *Patterns of Fire Casualties in Home Fires by Age and Sex, 1990-94* John Hall, NFPA, May, 1997

The best solution available is automatic fire sprinkler systems. The effectiveness of sprinkler systems in controlling fires and saving lives is unquestionable. According to a report from NFPA, “when sprinklers are present, the chances of dying in a fire and the average property loss per fire are both cut by one-half to two-thirds, compared to fires where sprinklers are not present.”⁴ This was demonstrated in a recent fire in a Tempe, Arizona, sprinklered board and care facility. An elderly woman fell asleep in a chair while smoking. The chair was ignited, and the woman was not able to extricate herself from the fire. The sprinkler system was activated and the fire was extinguished. While, tragically, the woman died, the other residents in the two story complex were not endangered by the fire.

Too often we see the tragic results of fires where sprinklers are not present. We must begin to make a change that will ensure the safety and well being of our nation’s elderly.

⁴ *US Experience with Sprinklers. Who has them? How well do they work?* Kimberly D. Rohr, NFPA, September, 1997

APPENDIX A ABSTRACTS FROM RELATED NFPA FIRE INVESTIGATIONS REPORTS

BROWARD COUNTY, FLORIDA

At approximately 3:45 a.m. on Thursday, December 1, 1994, an accidental fire occurred in a board and care facility in Broward County, Florida that resulted in the deaths of six residents.

The building was a one-story, single-family dwelling that had been modified for use as a board and care facility. The modifications included the construction of several bedrooms, the installation of a building-wide fire alarm system and single-station smoke detectors, and the installation of at least one exit door in every bedroom. These doors provided direct access to the building's exterior. Local fire officials were unable to secure detailed information regarding the capabilities of occupants; as a result, fire officials considered the occupants to have "slow" evacuation capabilities.

The fire, which started in a resident's bedroom, caused heavy damage in the room of origin and in an adjacent dining area. Smoke filled all rooms throughout the building. A staff person and eight residents were able to self-evacuate; six residents had to be rescued; and four residents died in the building. Two of the rescued residents later died, one before being transported to the hospital and the other in the hospital.

The 1994 *Life Safety Code*® anticipates various levels of resident performance, and requires more stringent fire protection equipment as the abilities of the residents decrease. The facility involved in this fire had many code-required fire protection provisions for residents with moderate abilities. Therefore, the ability (or inability) of residents to perform during the actual fire emergency was a major contributing factor affecting the survival of residents.

The effect that staff and resident capabilities had on the outcome of this incident is an important lesson for fire department officials, representatives of local and state agencies, and property owners who have responsibility for life safety in board and care facilities. They must understand that adequate life safety does not depend solely on building features and fire protection equipment. The abilities of both staff and

residents are integral factors that must be considered while striving for even a minimal level of life safety in a board and care facility.

LAURINBURG, NORTH CAROLINA

At approximately 10:00 p.m. on Sunday, March 17, 1996, a fire occurred in a single-story board and care facility in Laurinburg, North Carolina. Sparks from a faulty electrical receptacle ignited bedding materials in one of the resident rooms. Even though the fire involved only one room, smoke filled the smoke compartment where this room was located and smoke spread was mostly contained to that compartment. Eight residents died in this fire.

Both residents in that room escaped from the room, but only one safely evacuated the building. The other was overcome by smoke and died in the corridor. Approximately 18 other residents were on the wing of fire origin. Seven of these residents died in their respective rooms, and the other 11 self-evacuated. The doors to rooms in which residents died were in the open position. Staff, reportedly, were unable to enter the wing of fire origin due to severe conditions. The following factors contributed to the loss of life in this facility:

- Staff members inability to enter the fire area due to smoke and heat
- Occupants inability to evacuate before untenable conditions developed in the fire area
- Room doors that remained open due to the lack of door self-closing devices
- Lack of automatic sprinklers

SHELBY COUNTY, TENNESSEE

At approximately 11:45 p.m. on February 8, 1996, a fire occurred in a Shelby County board and care facility that was housing elderly residents. The fire was caused most likely by improperly disposed smoking materials. Smoke from the apartment of fire origin spread to other apartments through open doors. Four residents died as a result of this fire.

The 20-year-old facility had six wings and a central core. All areas were of wood-frame construction, and wall and ceilings assemblies were covered with gypsum wallboard. Four of the wings contained apartments for elderly residents and two wings contained apartments for elderly residents with special needs. These two wings will be classified as board and care occupancies. The fire occurred in one of the board and care wings. All areas in the building had various fire protection provisions including smoke detectors, fire alarms, fire doors, and door self-closing devices. In addition, the staff was reportedly trained with regard to fire safety.

The building construction and most fire protection equipment that was provided performed well. In many areas, gypsum wallboard walls and ceilings restricted the spread of combustion products. Smoke detection and fire alarm systems operated and cross-corridor doors equipped with self-closing devices remained closed, again, restricting the spread of combustion products to the wing of fire origin.

However, self-closing devices for many apartments, including the apartment of fire origin, had been removed or deactivated allowing doors to remain open. The open doors permitted smoke to spread from the fire apartment, fill the corridor with smoke and spread into several other apartments. Thus, the open doors compromised much of the benefit afforded by the gypsum wallboard wall and ceiling assemblies.

Staff rescued the resident in the apartment of fire origin, but he died several days later from burn injuries. Two other residents suffered smoke-related injuries and died in their respective apartments. Twenty-seven days after the fire, a fourth resident also died of a smoke-related injury.

Based on the NFPA's investigation and analysis of this fire, the following factors were considered as having contributed to the loss of life in this incident:

- Improperly disposed smoking materials
- Lack of automatic sprinkler protection
- Ineffective response of some staff members
- Failure of occupants to respond effectively to operating fire alarms
- Room doors that remained open due to the deactivation of door self-closing devices and chocks

MISSISSAUGA, ONTARIO

On Tuesday, March 21, 1995, at approximately 7:40 p.m., a fire occurred in a one-story board and care facility in Mississauga, Ontario. The fire resulted in eight fatalities and 12 injuries. Three people died at the time of the fire and one died five days later. The remaining four fatalities, determined to be related to the fire, occurred over a span of eight months.

The 70 occupants ranged in age from 60 to 101 years old. Many of the occupants had some degree of mental or physical impairment that could have impeded their ability for self rescue. Of the 70 occupants, 20 used wheelchairs, 17 used canes or walkers, and 15 suffered from varying degrees of mental impairment.

The building was a one story structure that was partially sprinklered in the basement area only. The resident's rooms were equipped with heat detectors, as were the hallways, which were connected to an alarm system. The alarm system was connected to an alarm monitoring company.

The fire was determined by the Ontario Fire Marshal's office to have been caused by smoking materials which ignited clothing in a closet in one of the rooms. The room was occupied by two people at the time of the fire, which occurred at 7:39 p.m. One of the occupants of the room called the fire department via 911 and reported the fire. She then was able to escape from the room via an exterior window. The other occupant, who was confined to a wheelchair, was not able to escape.

Six of the other fatalities were found in their rooms. One other victim, who was confined to a wheelchair, was found in the hallway, having become overcome by smoke while attempting to escape.

Smoke was able to spread to the other rooms through the void space above the rooms. The corridor walls and the walls between the individual units did extend above the ceiling to the underside of the roof diaphragm. However, smoke was able to penetrate into this void space via unprotected openings in the ceiling in the room of origin and then into the other areas through unsealed penetrations in the various walls.

In addition to the void space, smoke also penetrated into the rooms through the corridor doors to the individual units. In several of the rooms, the occupants died from smoke inhalation even though the door to their rooms were closed.

The following are considered significant factors that contributed to the outcome of this incident:

- The lack of sprinkler protection (except for the basement);
- The failure to close the door to the room of fire origin following detection of the fire;
- The combustible room contents; and
- The lack of staff training and fire drills.

This is the second fire to have occurred in a Mississauga facility housing elderly people with serious loss of life. In 1980 another fire in a nursing home killed 25 occupants. There are a number of common factors between the two fires, which include lack of an automatic sprinkler system and failure to close the door to the room of origin.

STE. GENEVIEVE, QUEBEC

A fire occurred on Saturday, August 31, 1996, at 12:30 p.m., in a board and care facility, which was occupied by 41 elderly residents. Seven residents died as a result of this fire.

The building was a two story structure that had an occupied basement, with a reinforced masonry exterior. The roof and floor structural systems were lightweight wood trusses. The ceilings were also either 1/2 inch (13-mm) or 5/8 inch (16-mm) gypsum wallboard, which were attached to the bottom chord of the trusses.

The building was not sprinklered. It was equipped with a fire alarm system that was comprised of system heat detectors in each of the rooms, two system smoke detectors in each hallway and two system heat detectors in each hallway. Manual fire alarm boxes also were located in the hallways. The system reportedly transmitted a signal to a central monitoring station.

There were eight staff members on duty at this time.

The fire was determined to have started in Room 208, which was occupied at the time. A staff member on the third floor heard a noise and went to the second floor to investigate. Upon arrival she saw the fire in the closet in Room 208. She proceeded to remove the occupant from the room and then went to sound the alarm.

The fire spread from the second floor to the third floor via an open exterior window on the room of origin, traveling up the outside of the building and then re-entered the building through a window directly above the room of origin. Also, at some point, the roof structure was ignited by direct flame impingement on the exterior of the building.

Fire also spread through the interior of the building when it breached the ceiling in the closet in Room 208 and then spread laterally through the floor trusses between the 200 and 300 levels. The wall between the resident's rooms and the corridor did not extend fully through the combustible void space. Fire and smoke also spread through the open door to the room of origin, into the corridor on the 200 level. Since the corridor doors and the stairwell doors were propped open, fire was also allowed to spread via these avenues.

All seven fatalities were residents who were on the third floor. According to information provided by the facility, four were considered ambulatory patients and three required the use of wheelchairs. Their ages ranged from 74 years old to 90 years old.

Based on the NFPA's investigation and analysis of this fire, the following, significant factors were considered as having contributed to the loss of life and property in this incident:

- Lack of automatic fire sprinklers
- Fire spread through a combustibile void space
- Inadequate corridor separation
- Combustible room contents
- Combustible contents in the corridors
- Delayed notification of the fire department
- Staff response
- Open doors on stairwells, on the occupant's rooms on the 300 level, and on the room of origin.

HARVEYS LAKE, PENNSYLVANIA

On Tuesday, May 13, 1997, a fire occurred at a board and care facility in Harveys Lake, Pennsylvania. State fire investigators determined that the fire most likely started on a screened-in porch. Investigators determined that the fire was caused by disposal of smoking materials on the screened-in porch area of the building. The fire killed ten residents and injured three others. The building was heavily damaged by the fire, and the property loss was estimated at \$270,000.

The facility was a two-story plus basement, wood-frame structure with several additions that had been made over time, which increased the size of the building. Fire protection features included a fire alarm system with smoke detectors and heat detectors, and fire extinguishers. Interior stairways were enclosed. Steel doors with self-closing devices protected openings to the stairways; however, the self-closing device on one of the stairway doors was deactivated. Wall and ceiling finishes were noncombustible. The facility was not equipped with an automatic sprinkler system.

One staff member and 21 residents were in the building at the time of the fire. The residents included elderly people and people with a range of mental abilities.

Investigators were not able to determine the type and frequency of fire safety training that had been provided for residents and staff.

Investigators determined that the fire started on an exterior screened-in porch that was being used as a smoking area. Once ignited, the fire involved the combustible materials used in the construction of the porch, combustible exterior siding for the building, and combustible furnishings. Investigators believe that the fire broke large windows between the porch and the interior of the building allowing the fire to enter one bedroom and a living room. At some point during these events, the building's fire alarm system operated automatically. The staff person attempted to reset the system, but could not. At this point, one of the residents confirmed that there was a fire. The staff person then took actions to assist in the evacuation of residents.

At approximately 9:10 p.m., the Harveys Lake Fire Department was notified of a fire at the board and care facility. Fire fighters began arriving on the scene about 3 minutes

later and they found that the building was heavily involved in fire. Many residents had escaped by the time that fire fighters arrived, and they reported to fire fighters that others were still in the building. Despite the severity of the fire, which prevented fire fighters from entering many areas, fire fighters were able to rescue six residents. Four of the residents who had been rescued, later died in the hospital. After the fire was extinguished, the bodies of six residents were found in various locations throughout the building. Preliminary information indicated that all residents died of smoke inhalation.

Based on the NFPA's investigation and analysis of this fire, the following factors were considered to have contributed significantly to the loss of life and property in this incident:

- Improper use or disposal of smoking materials
- Ineffective resident and staff action
- Inadequate means of egress
- Open fire doors in vertical fire separations
- Room doors with inadequate fire resistance ratings
- Lack of automatic door closing devices on individual room doors
- Lack of automatic sprinkler system

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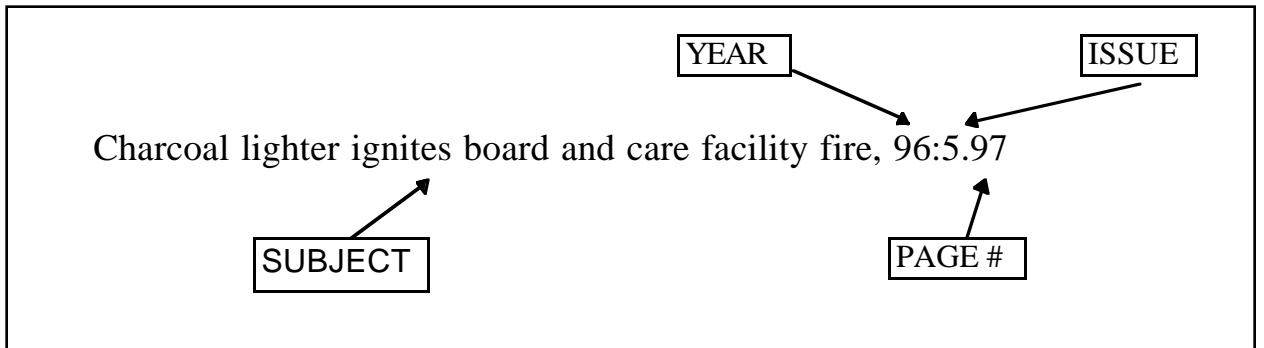
**NFPA Journal
10 Year Index 1987-1997**

**NFPA Journal
10 Year Index**

The following is a ten-year index (1987 to 1997) to the NFPA Journal. The following is a description of the codes used on the entries to identify the issue where a particular entry appeared.

Key to references:

- 1=January/February
- 2=March/April
- 3=May/June
- 4=July/August
- 5=September/October
- 6=November/December



NFPA Journal
10 Year Index 1987-1997

A

ACCELERANTS. *See also* GASOLINE

- Charcoal lighter ignites board and care facility fire, 96:5.97
- Gasoline ignites dwelling fires, 98:5.50
- Pyrotechnic accelerants used to ignite high-temperature fires, 92:6.67
- Unknown accelerant
 - Clinic fire ignited by, 96:1.24
 - Manufacturing plant fire ignited by, 95:6.104, 98:2.20
 - Restaurant fire ignited by, 97:2.21
 - School fire ignited by, 95:6.98
 - Store fire ignited by, 96:5.94
 - Vehicle/dwelling fire ignited by, 98:5.45
 - Warehouse fire ignited by, 92:6.26, 96:3.39

ADHESIVE MATERIALS

- Spontaneous ignition of, 91:6.26

ADULT CONGREGATE LIVING FACILITY FIRES

- Florida, 1994, 95:6.35

ADVERTISING SUPPLEMENTS

- Alarm devices and systems, 91:5.85, 92:4.79, 93:1.65, 93:6.105, 94:5.80, 95:2.96
- Apparatus and rescue products, 91:6.79, 92:5.77
- Building construction products, 91:2.128, 92:6.81, 93:5.105, 94:5.111, 95:5.126
- Detection devices and systems, 91:5.85, 92:4.79, 93:1.65, 93:6.105, 94:5.80, 95:2.96
- Electrical products, 94:5.111, 95:5.126
- Extinguishing systems, 91:1.106, 92:1.75, 93:4.73, 94:4.91
- Fire service equipment, supplies, and services, 93:2.89, 94:2.92, 95:1.87, 96:4.101
- Hazardous materials storage, 92:2.87
- Literature review, 95:4.103, 96:2.91, 96:6.116
- NFPA Annual Meeting exhibitors
 - 1994, 94:3.129
 - 1995, 95:3.135
 - 1996, 96:3.131
 - 1997, 97:3.109
 - 1998, 98:3.124
- Protective clothing, 91:1.106, 92:2.87
- Security systems, 93:6.105, 94:5.80, 95:2.96

AEROSOL CONTAINERS

- Containers in area of ignition accelerated fire, 98:6.89
- Explosion ignites dwelling fire, 92:6.28
- Flammable contents ignited by open flame, 92:6.25
- Flammable solvent/lubricant containers damaged by forklift, explode, 96:4.23
- Hair spray used to ignite incendiary fire, 94:1.32
- Incendiary fire ignited by, 97:1.27
- Insecticide ignited by LP-Gas pilot light, 93:4.25
- Paint cans explode in warehouse fire, 95:6.38

AIR CONDITIONERS. *See also* HVAC SYSTEMS

- Blocking window, factor in catastrophic fire, 98:5.45
- Fire spread by, 94:5.97
- Malfunction causes fatal fire, 98:4.20
- Operating noise masked alarm, 94:5.100

AIRCRAFT CRASH FIRES. *See also* AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

- Cargo aircraft
 - Military plane, crashes into restaurant/hotel, Indiana, Feb. 6, 1992, 93:5.66
 - Takeoff aborted, New York, March, 1991, 92:6.79

NFPA Journal
10 Year Index 1987-1997

Catastrophic

- B-727 and DC-9, runway collision, Michigan, Dec. 3, 1990, 91:4.70
 - Commercial commuter plane and private plane, runway collision, Illinois, Nov. 19, 1996, 97:5.54
 - Commercial jet, Florida, May 11, 1996, 97:5.54
 - Commercial plane, Georgia, Aug. 21, 1995, 96:5.99
 - DC-9, North Carolina, July 2, 1994, 95:5.68
 - F-16 and C-130 midair collision, North Carolina, March 23, 1994, 95:5.67
 - Four-engine turbo-prop plane, West Virginia, Oct. 7, 1992, 93:5.68
 - Four-passenger plane, Utah, July 9, 1992, 93:5.68
 - Light passenger plane, Alabama, June 23, 1996, 97:5.54
 - Light passenger plane, Kansas, Apr. 19, 1995, 96:5.100
 - Military cargo plane, crashes into restaurant/hotel, Indiana, Feb. 6, 1992, 93:5.66
 - Private passenger jet, California, Dec. 15, 1993, 94:5.106
 - Private passenger jet, Illinois, Oct. 30, 1996, 97:5.54
 - Runway collision, B-737 and twin-turbo prop, California, Feb. 1, 1991, 92:4.72
 - Seaplane, Rhode Island, Aug. 26, 1995, 96:5.99
 - Single-engine passenger plane, California, Nov. 26, 1993, 94:5.108
 - Single-engine plane, Oklahoma, Aug. 21, 1990, 91:4.70
 - Twin-engine plane, Alabama, July 10, 1991, 92:4.72
 - Twin-engine plane, Connecticut, April 27, 1994, 95:5.67
 - Twin-engine plane, Florida, Jan. 17, 1991, 92:4.72
 - Twin-engine plane, Georgia, Jan. 12, 1995, 96:5.100
 - Twin-engine plane, New York, March 22, 1992, 93:5.68
 - Twin-engine plane, Oklahoma, Dec. 21, 1995, 96:5.99
 - Twin-engine plane, Texas, Sept. 11, 1991, 92:4.72
 - Twin-engine plane, Virginia, Sept. 10, 1995, 96:5.99
 - DC-8 cargo plane crashes during takeoff, Florida, Aug. 7, 1997, 98:6.91
 - DC-9-35 crashes near runway, North Carolina, July, 1994, 95:6.110
 - DC-10 cargo jet, New York, Sept. 5, 1996, 97:6.60
 - Fokker F-28 passenger aircraft, New York, March, 1992, 93:6.88
 - Jetstream 4101 crashes into warehouse, Ohio, Jan., 1994, 95:6.110
 - Jumbo passenger jet, Texas, April, 1993, 94:6.98
 - L-1011 aircraft aborts takeoff, crashes, New York, Sept., 1992, 93:6.88
 - Lear jet crashes into residential/commercial area, Dec., 1994, 95:6.110
 - Military aircraft**
 - California, July 20, 1994, 6.110
 - Cargo plane, crashes into restaurant/hotel, Indiana, Feb. 6, 1992, 93:5.66
 - Fighter-jet, New Mexico, Sept., 1993, 94:6.98
 - North Carolina, June 21, 1994, 95:6.110
 - Runway collision**
 - Boeing 737 and Metroliner, California, Feb., 1991, 92:6.76
 - Detroit, Mich., Dec. 3, 1990, 91:3.69
 - Jet and cargo van, Georgia, May, 1991, 92:6.77
 - Simulated crash into high-rise tests emergency preparedness, 93:6.35
 - Statistics compared to motor vehicle fire statistics, 95:4.120
- AIRCRAFT CRASHES**
- Fire fighter injuries related to, 98:6.55
- AIRCRAFT FIRES (NONCRASH)**
- Airports, at (*See* AIRPORTS)
 - Military plane, California, Nov. 7, 1990, 91:6.74
- AIRCRAFT HANGAR FIRES**
- California, 1994, 95:5.36
 - Kansas, July, 1993, 94:6.96

NFPA Journal
10 Year Index 1987-1997

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

Debate continues on need for crews, funding, preparedness, types of rescue, 97:2.84
NFPA role in international aviation fire safety, 96:3.50

AIRPORTS. See also AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

Aircraft fire on runway

Catastrophic, California, Feb. 1, 1991, 92:4.72, 92:6.76
Catastrophic, Detroit Metropolitan Airport, Dec. 3, 1990, 91:4.70
Catastrophic, Illinois, Nov. 19, 1996, 97:5.54
Georgia, May, 1991, 92:6.77
Massachusetts, 1998, 98:4.22
New York, March, 1991, 92:6.79
New York, March, 1992, 93:5.68, 93:6.88
New York, Sept., 1992, 93:6.88

Catastrophic fires

Aircraft fire on runway, California, Feb. 1, 1991, 92:4.72, 92:6.76
Aircraft fire on runway, Detroit Metropolitan Airport, Dec. 3, 1990, 91:4.70
Aircraft fire on runway, Illinois, Nov. 19, 1996, 97:5.54
Military aircraft fire, Wisconsin, Dec. 10, 1993, 94:5.106, 94:6.98
Emergency response drill, Logan International Airport, Boston, Mass., 91:2.54
Life safety jeopardized by tighter airport security, 96:6.85
Tank farm fire, Stapleton Airport, Denver, Colo., Nov. 25, 1991, 92:1.60
Terminal fire, fatal, Düsseldorf, Germany, Apr. 11, 1996, 96:4.43
Washington, D.C. airports equipped with state-of-art fire protection and security systems, 98:4.80

ALABAMA

Catastrophic camping trailer fire, Dec. 6, 197, 98:5.56
Catastrophic dwelling fire, July 20, 1997, 98:5.50
Catastrophic fires
Aircraft, July 10, 1991, 92:4.72
Aircraft, June 23, 1996, 97:5.54
Board and care facility, Jan. 7, 1990, 91:4.67
Board and care facility, Sept. 19, 1990, 91:4.68
Board and care facility, Oct. 19, 1994, 95:5.62
Dwelling, Aug. 27, 1990, 91:4.64
Dwelling, Nov. 12, 1996, 97:5.51
Electric generating plant fire, Nov., 1991, 92:6.76
Electric generating plant fire, June, 1993, 94:6.92
Electric generating (nuclear) plant fire, May 23, 1996, 97:6.58
Fatal dwelling fire, 1995, 96:3.39
Manufactured home fire, 1992, 93:4.25
Manufacturing plant fire, Feb., 1994, 95:6.107
Nuclear energy plant fire, May 23, 1996, 97:6.58
Warehouse fire, 1992, 93:4.26
Warehouse fire, Oct. 2, 1997, 98:6.88

ALARM DELAYED

Alarms

Monitored alarm, lack of, 97:4.22
Not heard outside empty building, 95:6.108
Not in area of fire, 97:6.50
Not set off immediately, 92:3.32
Waterflow alarm did not operate, 96:3.39
Waterflow alarm incorrectly installed, 91:3.25
Central station notification of fire service delayed, 97:2.21
Cruise vessel delayed alarms factor in fatal fires, 98:3.66

NFPA Journal
10 Year Index 1987-1997

Detection system lacking, 93:6.79, 94:5.102, 97:6.52, 98:4.22
Detector alarms not heard outside empty building, 95:6.108
Detectors, smoke
 Below area of fire origin, 95:6.106
 Lacking, 95:1.34
 Not functioning, 92:6.29, 94:1.30, 97:3.29
 Not set off immediately, 92:3.32, 95:2.30
Detectors below fire, 95:6.99, 95:6.106
Dispatched to wrong address, 94:5.29, 95:5.64
Employee(s), role of
 Confirmed fire, 91:1.30, 91:5.64, 92:4.71, 92:5.56, 92:6.74, 93:6.81, 94:4.31,
 94:6.89, 95:4.39, 40, 95:6.98, 97:5.54, 98:6.23
 Evacuated patients, 94:4.29
 Failed to locate source of fire, 96:6.24
 Failed to use manual alarms, 92:6.29
 Fought fire, 91:2.31, 91:3.26, 91:4.67, 91:6.23, 25, 73, 75, 92:2.28, 92:4.25,
 92:6.77, 79, 93:1.26, 93:2.20, 93:6.82, 83, 85, 89, 94:2.27, 30, 94:5.30,
 94:6.96, 97, 95:1.34, 95:2.31, 95:6.104, 106, 107, 96:6.64, 97:2.21, 3.33,
 5.24, 6.19, 50, 56, 98:4.20, 5.18, 6.89
 Left site to report fire, 93:6.30
 Mistook alarm for false alarm, 98:5.53
 Mistook fire alarm for intrusion alarm, 93:6.30
 Reported fire as under control, 93:3.34
Fire burned undetected, 91:1.28, 91:5.28, 97:5.49, 98:6.84, 85, 86, 88, 92
Fire department advised to disregard alarms due to scheduled building maintenance,
97:6.49
Hotel room occupant had difficulty contacting front desk, 94:2.28
Industrial area unpopulated due to holiday, 93:6.82
Interior location of fire, 93:1.28
Manual pull stations not operational, 94:5.95
Motion alarms not set off immediately, 92:3.32
Neighbor(s), role of
 Fought fire, 95:5.34
 Refused to call fire department, 92:4.69
911 call incomplete, 94:5.102
911 called prior to alarm box report, 93:2.20
911 dispatcher misunderstood nature of call, 98:5.16
911 system lacking, 95:5.58
No fire detectors, 92:1.23, 26, 95:6.108
Occupant(s), role of
 Attempted rescue, 91:4.68, 96:3.39, 97:2.22
 Called police, 3/25
 Fought fire, 91:2.29, 91:3.91:3.6, 91:4.47, 91:4.69, 92:4.26, 67, 92:5.25, 93:1.27,
 94:1.31, 94:5.98, 102, 95:3.38, 95:4.37, 95:5.53, 96:1.23, 96:5.23, 97:2.22,
 5.21, 98:1.23, 2.18, 6.23, 90
 Left site to report fire, 93:3.34, 94:5.97, 96:6.22
 Searched for fire, 91:1.30
Passer(s)by, role of
 Attempted rescue, 91:4.64
 Left site to report fire, 94:3.30, 95:5.35
 Tried to locate smoke source, 91:4.64
Plant closed for weekend, 91:5.28, 92:1.23
Power shut off, 93:6.84
Protection systems unsupervised, 93:5.67

NFPA Journal
10 Year Index 1987-1997

Reason unknown, 94:5.95, 95:5.36, 95:6.38
Remote location, 92:1.23, 93:5.62, 93:6.83
Security personnel confirmed fire, 97:5.23
Shopping mall closed for night, 97:4.21
Sprinkler system not connected to central alarm, 93:1.26, 95:3.39
Telephones not available at site/building, 95:5.58, 96:1.23
Telephones not operable due to fire, 93:5.66, 93:6.29, 30, 95:6.99, 96:6.22, 97:6.50
Water motor gong outside building not heard, 91:5.25
Waterflow alarms
 Did not operate, 96:3.39
 Incorrectly installed, 91:3.25
Weather obscured fire, 92:1.23

ALARM SYSTEMS

Addressable systems, testing of, 94:2.41
Computer use in, 92:2.32
Design of, 92:4.12
Inspection, testing, and maintenance to ensure reliability, 96:5.68
Installer certification required in Seattle, 93:1.55
Integrated fire and security systems in commercial buildings, 97:3.60
Intelligent systems eliminate false alarms without compromising protection, 97:6.78
Manual pull stations not operational, factor in catastrophic apartment building fire, 98:5.45
Manual pull stations not operational, factor in catastrophic hotel fire, 94:5.95
Manual pull stations not operational, factor in fatal fire, 97:4.19
Manual system out of service, factor in school fire, 98:1.21
Modified redundant systems increase safety, not cost, 93:6.68
Multisensor alarms speed detection, reduce nuisance alarms, 98:1.46
NFPA 72, *The National Fire Alarm Code*
 72 and UL standards provide comprehensive equipment and installation requirements, 93:5.25
 1996 edition, questions answered, 97:4.25
 Consolidates signaling standards, 93:5.70
 Previous standards combined, 91:5.86
Proprietary system at Chrysler Corp. Technology Center, 95:3.129
Reliable hardware, system design, installation, maintenance all needed, 95:1.49
Software management is crucial, 95:1.54
Sound and strobe alarms required by Americans with Disabilities Act, 95:4.58
Terminology needs clarification by users, engineers, designers, code enforcers, 98:5.62
Voice alarm system design guidelines, 94:1.50

ALARMS, FALSE

Catastrophic fire alarm delayed because assumed false alarm, 98:5.53
Causes, costs, and solutions to U. S. false alarm problem, 95:1.45
Delayed response in fatal fire, 95:6.37
Delayed response to catastrophic fire, 94:5.98
Intelligent systems eliminate false alarms without compromising protection, 97:6.78
Multisensor alarms can reduce false alarms and speed detection, 98:1.46

ALASKA

Catastrophic ship fire, July 27, 1996, 97:5.54
Hotel fire, March 20, 1996, 97:6.57
Manufacturing plant fire, April 3, 1997, 98:6.84
Store fire, April, 1994, 95:6.100
Vacant manufacturing plant fire, April 25, 1997, 98:6.92
Wildland/urban interface fire, June 2, 1996, 97:6.59

ALBERTA, CANADA

NFPA Journal
10 Year Index 1987-1997

- Apartment building fire, 1990, 91:5.26
- Bulk storage elevator fire, 1996, 97:4.20
- ALCOHOL (BEVERAGE)
 - Apartment building fires, factor in, 91:3.26, 92:4.69, 95:5.34, 96:5.24, 96:5.91
 - Catastrophic fires, factor in
 - Apartment building fires, 92:4.69, 96:5.91, 98:5.49
 - Automobile fire, 95:5.68
 - Board and care facility fire, 96:5.96
 - Dwelling fires, 91:4.64, 65, 66, 68, 92:4.68, 93:5.64, 94:5.97, 95:5.60, 96:5.92, 93, 98:5.49
 - Fraternity house fire, 97:5.50
 - Motor vehicle accident/fire, 98:5.55
 - Dwelling fires, factor in, 91:4.64, 65, 66, 68, 92:4.68, 93:2.22, 93:5.64, 94:1.31, 94:5.97, 95:5.60, 96:5.92, 93
 - Fatal fires, factor in
 - Apartment building fire, 95:5.34, 98:2.16
 - Dwelling fire, 93:2.22, 94:1.31, 98:1.23, 4.19
 - Fraternity house fire, 97:6.21
 - Hotel fire, 98:6.23
 - Manufactured home fire, 98:1.23
 - Manufacturing plant fire, 98:6.22
 - Motor home fire, 95:5.36
 - Shed fire, possible factor in, 93:2.20
 - Fraternity house fire, factor in, 97:5.50, 6.21
 - Group home fire, factor in, 92:1.26
- ALCOHOL (FUEL)
 - Possible misuse in kerosene heater, fatal fire cause, 98:2.16
 - Spill ignited by light, 94:2.27
- ALMAND, KATHLEEN H.
 - Profile of, 98:3.54
- AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - U. S. response to European economic unification and global standards led by, 91:6.54
- AMERICANS WITH DISABILITIES ACT
 - Accessibility standard set by act, 93:3.42
 - Builders and owners, effects on, 92:2.14
 - Life Safety Code* changed to conform with, 93:3.18, 94:2.34
 - New technologies aid compliance, 97:6.38
 - Title III, discussion of, 95:4.54
- AMMONIA
 - Liquid refrigerant, factor in warehouse fire, 94:3.27
- AMUSEMENT CENTER FIRES
 - New Jersey, Dec., 1992, 93:6.79
 - Tennessee, July, 1992, 93:6.81
- AMUSEMENT PARK FIRES
 - Arizona, April, 1995, 96:6.73
 - California, 1993, 94:3.28
- APARTMENT BUILDING FIRES. *See also* CONDOMINIUM FIRES; HOUSING FOR ELDERLY FIRES
 - Alberta, Canada, 1990, 91:5.26
 - Arizona, 1994, 95:6.37
 - Arkansas, 1993, 94:3.28
 - California, 1990, 91:4.26, 91:5.26
 - California, Nov., 1993, 94:6.89
 - California, Dec., 1994, 95:6.110

NFPA Journal
10 Year Index 1987-1997

California, 1996, 97:3.30
California, 1997, 98:2.18, 4.19, 5.15
Catastrophic
California, Sept. 7, 1991, 92:4.69
California, April 26, 1993, 94:5.96
California, May 3, 1993, 94:5.95
California, June 6, 1994, 95:5.59
California, Oct. 14, 1995, 96:5.93
California, Feb. 6, 1996, 97:5.49
California, Dec. 13, 1997, 98:5.46
Illinois, May 30, 1990, 91:4.65
Illinois, March 14, 1991, 92:4.69
Illinois, Dec. 9, 1991, 92:4.67
Illinois, Dec. 6, 1992, 93:5.64
Illinois, March 20, 1994, 95:5.53
Illinois, Sept. 15, 1997, 98:5.46
Illinois, Oct. 26, 1997, 98:5.46
Kentucky, Sept. 12, 1997, 98:5.46
Louisiana, Aug. 10, 1994, 95:5.60
Massachusetts, March 21, 1994, 95:5.59
Massachusetts, Dec. 28, 1997, 98:5.49
Michigan, July 31, 1991, 92:4.68
Michigan, Feb. 28, 1993, 94:5.95
Minnesota, Nov. 10, 1993, 94:5.97
Minnesota, Feb. 28, 1994, 95:5.58
Minnesota, Jan. 14, 1995, 96:5.91
Mississippi, Jan. 26, 1993, 94:5.95
New Jersey, Feb. 13, 1991, 92:4.69
New Jersey, May 6, 1997, 98:5.45
New York, Jan. 16, 1990, 91:4.65
New York, Aug. 4, 1990, 91:4.66
New York, March 13, 1991, 92:4.67
New York, Aug. 22, 1994, 95:5.66
North Carolina, Sept. 5, 1993, 94:5.100
Ohio, Dec. 11, 1993, 94:5.102
Ohio, Jan. 12, 1994, 95:5.58
Oregon, June 28, 1996, 97:5.49
Pennsylvania, April 5, 1997, 98:5.45
Rhode Island, Feb. 27, 1993, 94:5.96
Rhode Island, Dec. 23, 1995, 96:5.93
Texas, Aug. 21, 1993, 94:5.100
Colorado, 1997, 98:4.20
Colorado, July 18, 1997, 98:6.90
Connecticut, 1996, 97:2.21, 5.21
Florida, 1990, 91:3.25, 91:6.24
Florida, 1992, 93:1.27
Florida, 1993, 94:5.27, 94:6.33
Florida, 1995, 96:1.23
Florida, 1996, 97:3.29
Hawaii, 1993, 94:2.28
Illinois, 1990, 91:4.25
Illinois, 1993, 94:1.31
Illinois, 1994, 95:4.37
Louisiana, 1997, 98:2.16

NFPA Journal
10 Year Index 1987-1997

Maine, 1995, 96:5.24
Maryland, 1989, 91:2.29
Maryland, 1991, 92:3.34
Massachusetts, 1990, 91:3.26
Massachusetts, 1992, 93:6.28
Massachusetts, 1994, 95:5.34
Massachusetts, 1995, 96:1.22
Massachusetts, 1997, 98:4.19
Michigan, Feb., 1994, 95:6.99
Missouri, 1994, 95:3.37
Nebraska, 1997, 97:5.22
New Hampshire, 1990, 92:1.26
New Jersey, 1991, 92:2.28
New Jersey, 1996, 97:5.22
New Jersey, 1997, 98:3.41
New York, 1993, 94:5.27
New York, May, 1993, 94:6.90
New York, March 28, 1994, 95:6.85
New York, Aug., 1994, 95:6.100
New York, 1996, 97:6.20
New York, 1997, 98:2.18
North Carolina, 1994, 95:4.38, 95:5.34
Ohio, 1993, 94:2.29
Ohio, 1995, 96:5.24
Ohio, 1996, 97:4.20
Oregon, 1996, 97:3.30
Pennsylvania, 1990, 91:4.26
Rhode Island, 1992, 93:2.22
Texas, 1996, 97:2.22
Texas, Jan. 16, 1997, 98:6.90
Utah, 1994, 95:6.36
Utah, 1995, 96:2.23
Utah, 1996, 97:5.21
Vermont, 1996, 97:2.22
Virginia, 1992, 93:3.35
Virginia, 1993, 94:3.28
Virginia, 1997, 98:5.15, 6.22
Washington, 1995, 96:1.22
Washington, 1996, 97:1.25
Washington, 1997, 98:6.23
Washington, Nov. 13, 1997, 98:6.90
APARTMENT COMPLEX FIRES
California, Nov. 10, 1990, 91:6.73
California, 1992, 93:5.35
California, 1993, 94:2.28
Georgia, 1995, 96:1.22
Massachusetts, 1989, 91:3.26
Missouri, elderly housing, 91:1.30
New Jersey, 1993, 94:1.32
New Mexico, July, 1995, 96:6.74
Ohio, March, 1992, 93:6.81
APOLLO I SPACECRAFT
Fatal fire, 96:1.68
AQUEOUS FILM-FORMING FOAM (AFFF)

NFPA Journal
10 Year Index 1987-1997

Concentrate extinguishes aircraft fire, 92:6.76
Limited prepiping hinders operations in fuel tank fire, 91:6.73

ARENAS

Crown Coliseum, Cincinnati, Ohio, updates fire protection system, 98:3.120

ARIZONA

Athletic complex fire, 1993, 94:5.30
Catastrophic fires
Dude wildland/urban interface, June 25, 1990, 91:1.59, 91:4.70, 91:6.78
Dwelling, Nov. 5, 1993, 94:5.97
Dwelling, March 26, 1995, 96:5.92
Dormitory fire, 1990, 91:2.29
Dwelling fire, 1993, 94:6.34
Fatal apartment building fire, 1994, 95:6.37
Manufacturing plant fire, Nov. 12, 1992, 93:4.33
Motor vehicle repair shop fire, 1990, 91:5.28
Movie studio/amusement park fire, April, 1995, 96:6.73
Nursing home fire, 1993, 94:4.29
Store fire, March 21, 1998, 98:4.49
Warehouse fire, Nov., 1992, 93:6.86

ARKANSAS

Apartment building fire, 1993, 94:3.28
Catastrophic fires
Building-under-renovation, June 18, 1993, 94:5.104
Manufactured home, Dec. 28, 1997, 98:5.50
Motor vehicle, Jan. 9, 1995, 96:5.99
Nursing home, March 13, 1990, 91:4.67
Packaging and storage facility, May 8, 1997, 98:5.53
Electric generating plant fire, Aug., 1993, 94:6.92
Fatal dwelling fire, 1997, 98:1.23, 4.19, 6.23
Fatal manufacturing plant fire, Aug., 1994, 95:6.107
Incinerator plant fire, 1994, 95:6.38
Manufacturing plant fire, 1990, 91:5.28
Manufacturing plant fire, 1992, 93:4.27
Manufacturing plant fire, Dec., 1993, 94:6.94
Manufacturing plant fire, Dec., 1994, 95:6.106
Manufacturing plant fire, July, 1994, 95:6.104
Manufacturing plant fire, May 20, 1995, 96:6.64
Shopping mall fire, 1996, 97:4.21

ARSON. See INCENDIARY (SUSPICIOUS) FIRES

ASBESTOS

Emergency response protocols for asbestos abatement site fires, 92:3.55
Exposure response policy, New York, N. Y., 92:1.42
Haz-mat contamination, terminal fire, 92:6.76
Haz-mat team gathers particles from ducts after fire, 97:6.22

ASHES

Boiler blocked by, caused explosion, 94:6.92
Careless disposal of
Apartment building fire cause, 98:6.22
Catastrophic dwelling fire cause, 93:5.64
Clubhouse fire cause, 91:6.23
Dwelling fire cause, 92:1.21, 98:1.22

ASPHALT

Ignited in roof fire, 94:6.95
Leaked asphalt ignited by unknown source, 93:6.84

NFPA Journal
10 Year Index 1987-1997

ASPHYXIATION

Fire fighter fatalities related to, 97:4.60

ATLANTA, GA.

Stadium fire, July 20, 1993, 94:4.49

ATTICS

Fire spread into, 91:3.26, 91:4.67, 91:6.77, 92:2.25, 92:4.69, 93:5.64, 94:5.28, 100, 95:4.39, 95:5.36, 95:6.98, 100, 108, 96:1.21, 96:5.25, 96:6.65, 97:1.27, 2.22, 4.20, 21, 5.50, 51, 6.52, 53, 58

Fire spread through, 91:6.23, 92:6.76, 94:4.31, 96:6.64, 73, 98:1.21, 6.22, 6.86

Fire started in, 92:4.70, 94:4.29, 96:1.24, 97:2.23, 98:6.90

Lack of separations factor in fire spread, 95:6.108

AUSTIN, STEPHEN P.

Profile of, 96:5.38

AUSTIN, TEXAS

City contracts with volunteer fire departments, 91:2.104

Fire service uses media attention to increase fire safety, 97:2.33

Recruiting and retaining fire protection engineers, Austin Fire Department survey, 93:1.58

AUSTRALIA

Fenny Creek/Dandenongs wildfire, 1996, firefighter's account, 97:2.49

AUTOMOBILE FIRES. *See also* TRUCK FIRES

California, 1990, 91:2.32

Catastrophic

California, Jan. 23, 1990, 91:4.70

California, Oct. 2, 1990, 91:4.72

California, July 22, 1991, 91:4.67

California, Nov. 29, 1991, 92:4.73

California, March 3, 1994, 95:5.68

California, June 18, 1995, 96:5.97

California, Sept. 10, 1995, 96:5.100

California, Dec. 28, 1996, 97:5.55

Florida, March 17, 1993, 94:5.106

Florida, Nov. 9, 1996, 97:5.55

Georgia, Apr. 3, 1996, 97:5.54

Idaho, July 4, 1997, 98:5.55

Iowa, Nov. 23, 1994, 95:5.68

Kentucky, Aug. 6, 1996, 97:5.54

Kentucky, Sept. 27, 1996, 97:5.55

Missouri, Feb. 4, 1990, 91:4.70

New Jersey, Feb. 17, 1997, 98:5.55

Pennsylvania, Nov. 8, 1992, 93:5.68

Tennessee, Dec. 11, 1990, 91:4.70

Tennessee, Nov. 11, 1994, 95:5.68

Texas, July 12, 1993, 94:5.108

Texas, Jan. 18, 1994, 95:5.68

Virginia, Aug. 1, 1994, 95:5.68

West Virginia, July 26, 1990, 91:4.69

Fire statistics and fire safety information, 98:2.88

Illinois, 1993, 94:1.32

Kansas, 1994, 95:2.31

Oregon, July, 1992, 93:6.84

Texas, 1991, 92:2.28

AUTOMOBILE REPAIR SHOP FIRES

Arizona, 1990, 4/30

NFPA Journal
10 Year Index 1987-1997

California, 1990, 91:2.30
Catastrophic, Ohio, Nov. 11, 1991, 92:4.70
Colorado, 1996, 97:1.26
Georgia, Jan., 1994, 95:6.100
Massachusetts, 1990, 91:2.31
Massachusetts, 1996, 97:2.23
Michigan, 1990, 91:2.30
Michigan, 1995, 96:3.40
New Mexico, May, 1995, 96:6.70
Ontario, Canada, 1989, 91:1.89
South Carolina, 1996, 97:5.23
Texas, 1990, 91:2.31
Washington, 1995, 96:6.21

B

BACKDRAFTS

Fire fighter injuries related to, 97:6.75
Model of incident, apartment building fire, N. Y., N. Y., March 28, 1994, 95:6.85

BAILEY, DAN W.

Profile of, 92:1.16

BALCONIES

Apartment building fire started on, 91:5.26, 96:2.23, 98:6.22
Fire spread to, 97:5.52

BARGE FIRES

Catastrophic
Illinois, July 3, 1997, 98:5.55
Louisiana Oct. 30, 1990, 91:4.70
Florida, Aug., 1993, 94:6.98
Massachusetts, 1997, 98:4.22

BARN FIRES

Illinois, 1990, 91:2.32
Massachusetts, 1995, 96:2.25

BARRACKS FIRES

Washington, May 11, 1990, 91:6.77

BATHURST, DONALD G.

Profile of, 93:6.20

BEDDING. *See also* MATTRESSES

Candle, ignited by, 95:5.53
Catastrophic fire involving, 91:4.65, 91:4.69
Cigar dropped by elderly, disabled person, ignited by, 98:5.15
Cigarette, ignited by, 94:2.30, 95:2.30, 98:6.23
Cigarette lighter, ignited by, 95:2.31, 95:5.54
Cigarette lighter, ignited by child playing with, 93:6.28, 94:5.97, 95:4.37
Cigarette lighter, ignited by juvenile with, 91:5.26
Detention center inmate, ignited by, 97:1.27
Electric heater, ignited by, 91:1.30, 94:5.98
Electrical receptacle arc in catastrophic fire, ignited by, 97:5.52
Fireworks, ignited by, 92:4.26
Gasoline in fatal fire, ignited by, 92:2.28
Incense, ignited by, 98:4.19
Kerosene heater in fatal fire, ignited by, 95:1.34
Lamp plug, ignited by, 91:3.25
Marijuana cigarette, ignited by, 97:5.22
Match, ignited by, 94:5.97
Medical equipment fire, ignited by, 94:5.104

NFPA Journal
10 Year Index 1987-1997

- Open-flame device, ignited by child(ren) playing with, 96:5.92
- Smoking materials, ignited by, 96:5.92
- Smoking materials in catastrophic fires, ignited by, 95:5.64
- Space heater, ignited by, 95:5.53
- Sparkler, ignited by, 97:2.21
- BELL, A. D.
 - Profile of, 95:5.26
- BENARICK, GLENN P.
 - Profile of, 94:1.22
- BERND, ROBERT E.
 - Profile of, 98:1.36
- BEVERLY HILLS SUPPER CLUB FIRE
 - Overview of fire, 96:2.64
- BEYREIS, JAMES R.
 - Profile of, 94:5.20
- BLAIR, JOHN A.
 - Profile of, 91:6.18
- BLEVE
 - Fire fighter fatalities related to, 94:4.60
 - Forklift gas cylinder BLEVEs, 96:6.63
 - LP-Gas tank, Iowa, April 9, 1998, fire investigation report, 98:6.42
 - Propane cylinders, 91:6.23, 97:3.33
- BLISS, DONALD P.
 - Profile of, 98:4.36
- BOARD AND CARE FACILITY FIRES
 - California, 1993, 94:2.30
 - California, 1996, 97:1.27
 - Catastrophic
 - Alabama, Jan. 7, 1990, 91:4.67
 - Alabama, Sept. 19, 1990, 91:4.68
 - Alabama, Oct. 9, 1994, 95:5.62
 - California, Oct. 3, 1995, 96:5.97
 - Colorado, March 4, 1991, 92:4.70
 - Connecticut, Feb. 10, 1996, 97:5.53
 - Florida, Dec. 1, 1994, 95:5.64
 - Georgia, March 11, 1991, 91:4.67
 - Michigan, June 2, 1992, 93:5.66
 - Michigan, Nov. 11, 1995, 96:5.97
 - New York, Oct. 17, 1990, 91:4.68
 - Oregon, Jan. 12, 1995, 96:5.96
 - Pennsylvania, Aug. 20, 1996, 97:5.52
 - Pennsylvania, May 14, 1997, 98:5.53
 - South Carolina, Nov. 22, 1990
4.69
 - Tennessee, Feb. 8, 1996, 97:5.52
 - Texas, Aug. 13, 1990, 91:4.68
 - Texas, April 11, 1993, 94:5.105
 - Wisconsin, Dec. 31, 1990, 91:4.69
 - Detroit, Michigan, June 2, 1992, 93:1.29
 - Fatal fires, 1994-1998, investigation report, statistics on contributing factors, and protection, 98:5.34
 - Life Safety Code protection requirements questioned, 97:5.68
 - Massachusetts, 1995, 96:2.24
 - North Carolina, March 17, 1996, 97:5.52

NFPA Journal
10 Year Index 1987-1997

- Pennsylvania, 1993, 94:6.33
- Pennsylvania, May 4, 1997, analysis, 97:5.68
- Quebec, Canada, Aug. 31, 1996, analysis, 97:1.44
- Vermont, 1995, 96:3.36
- BOARDING HOUSE FIRES. *See* ROOMING HOUSE FIRES
- BOARDWALKS. *See* PIER AND WHARF FIRES
- BOATS
 - Electrical safety requirements for repair equipment, wiring, 95:5.40
 - Yacht manufacturing plant fire, Florida, 1996, 97:1.28, 6.50
- BOAT FIRES. *See also* SHIP FIRES
 - Catastrophic
 - Cabin cruiser, Ohio, May 9, 1993, 94:5.106
 - Sailboat, California, Nov. 16, 1991, 92:4.73
 - Kentucky, 1997, 98:3.42
 - Marina, Connecticut, 1990, 91:6.26
 - Massachusetts, 1994, 95:4.39
 - Ohio, March, 1992, 93:6.81
 - Power boat, Nebraska, 1990, 91:4.31
 - Yacht, Florida, Apr. 19, 1996, 97:6.60
- BOATYARDS
 - Electrical safety requirements, 95:5.40
- BOEHLERT, SHERWOOD
 - Profile of, 96:1.36
- BOSTON, MASS.
 - Fire department overview, 96:3.110
 - Fire department profile, 91:2.93
 - Fire landmarks in city, 96:3.104
 - Logan International Airport, emergency response drill, 2/54
 - Nightclub fire, 194291:3.74, Nov. 28
 - Simulated plane crash into Hancock Tower tests emergency preparedness, 93:6.35
 - Terrorist response training funded by Domestic Preparedness Act, 98:1.38
- BOULDER, COLO.
 - Fire inspection requirements determined by life safety evaluation, 95:1.57
- BOYD, HOWARD F.
 - Profile of, 93:4.18
- BOYD, WAYNE H.
 - Profile of, 98:4.39
- BRACE, TOM
 - Profile of, 96:4.37
- BRANCH DAVIDIAN COMPLEX FIRE
 - Fire investigation, Congressional testimony, 95:6.91
- BRANNIGAN, FRANK
 - Profile of, 95:1.23
- BREEDLOVE, DIANE
 - Profile of, 94:2.22
- BRICE, HERMAN W.
 - Profile of, 94:3.21
- BRIDGE FIRES
 - Connecticut, 1996, 97:3.34
- BRITISH COLUMBIA, CANADA
 - Manufacturing complex fire, 1991, 92:2.26
- BRUNO, HAL
 - Profile of, 96:2.38
- BRUSH FIRES

NFPA Journal
10 Year Index 1987-1997

Fire fighter injuries related to, 94:6.64, 66
Wildland fire ignited by, 94:6.99

BUGBEE, PERCY

Past NFPA general manager, 95:6.77

BUILDING CODES

Coordination of model codes, discussion of, 91:2.72
Overview of history and content, 92:3.42

BUILDING MATERIALS

European Community product testing standards will affect U. S. products, 92:5.45
Glazing developments offer alternatives to wired glass, also raises code questions,
98:6.76

Through-penetration protection systems, 94:1.54

BUILDING SCENE COLUMNS

Adequacy and validity of existing fire tests, 94:2.14
Alarm system design, 92:4.12
Americans With Disabilities Act affects builders, owners, 92:2.14
Americans with Disabilities Act spurs changes to *Life Safety Code*, 93:3.18
Basis-for-design reports help authority having jurisdiction and building owner, 95:4.24
Cooperation needed to meet fire safety goals, 96:3.46
Design-related sprinkler system problems, 93:6.12
Doors, windows, walls, classification of assemblies as, 91:2.26
Elevators as means of egress, 96:1.30
Engineering life safety in high-rise buildings, 92:1.12
Establishing industrial fire safety programs, 93:2.12
Evaluating equivalencies and exceptions to fire code standards, 95:1.16
Evaluating occupant load for egress, 94:1.14
Field modifications to fire doors, 92:6.12
Fire-retardant wood shakes/shingles, 91:1.24
Glazing materials labeling controversy, 91:6.12
Life Safety Code, 1991, changes in, 91:3.33
Life Safety Code, 1991, contents and furnishing regulations, 91:4.20
Life Safety Code, building security provisions, 92:5.22
NFPA 13, *Installation of Sprinkler Systems*, 1991 edit., 91:5.12
NFPA 13, *Installation of Sprinkler Systems*, 1994, changes in, 94:3.14
NFPA 101, *Life Safety Code*, applied to industrial occupancies, 94:4.16
Occupant load calculation myths, 96:6.30
Out-of-service fire protection systems, procedures for, 96:4.30
Partnership of owners, designers, and public officials a must in fire protection, 93:1.12
Performance objectives for existing buildings, 95:6.22
Performance-based code development, 94:6.16, 95:2.16
Performance-based codes, 92:3.20
Performance-based codes, designing buildings for, 95:5.20
Performance-based codes based on existing codes, 95:3.24
Preventing detector nuisance alarms, 93:5.16
Regulations' effect on innovative construction methods, 96:2.32
Top five excuses for ignoring fire protection requirements, 96:5.32
Warehouse sprinkler system design, 93:4.16

BUILDING-UNDER-CONSTRUCTION FIRES. See also DWELLING-UNDER-CONSTRUCTION FIRES

Apartment building, California, 1997, 98:2.18
Apartment complex, California, Nov. 10, 1990, 91:6.73
Catastrophic, observatory, Hawaii, Jan. 16, 1996, 97:5.52, 6.59
Museum, Oregon, 1994, 95:6.35
Ohio, March, 1994, 95:6.110

NFPA Journal
10 Year Index 1987-1997

- Postal facility, Massachusetts, 1990, 91:3.27
- BUILDING-UNDER-RENOVATION FIRES**
- California, 1991, 92:5.26
- Catastrophic
- Dwelling, Arkansas, June 18, 1993, 94:5.104
 - Grain elevator, Indiana, Oct. 1, 1996, 97:5.52
 - Historic building, West Virginia, 1996, 97:6.22
 - Manufacturing plant, South Dakota, Dec. 15, 1990, 91:6.75
 - Massachusetts, 1997, 98:3.42
 - Pennsylvania, 1997, 98:6.24
 - Recreational facility, Illinois, March, 1992, 93:6.88
 - Warehouse/homeless shelter, Washington, 91:4.31
- BUKOWSKI, RICHARD W.**
- Profile of, 94:1.23
- BURNING ISSUES COLUMNS**
- Candle fire statistics and fire safety information, 98:3.160
 - Carbon monoxide poisoning, causes, symptoms, prevention, 97:6.120
 - Children and fires, statistics, 95:5.144
 - Cigarette smoking statistics, 95:3.160
 - Disabled persons, fire safety for, 96:4.112
 - Dormitory fire statistics, 97:3.152
 - Elderly and fires, statistics, 96:2.104
 - Fire safety checklist, 97:1.104
 - Fire safety for preschoolers, 97:2.112
 - Fireworks incident statistics and safety, 98:4.96
 - Holiday and heating season fire safety, 98:6.120
 - Home heating equipment, risks of, 96:6.128
 - Kitchen fire statistics, fire safety information, 98:1.88
 - Motor vehicle and aircraft fire statistics compared, 95:4.120
 - NFPA codes and standards being updated, 96:5.120
 - 100s in NFPA history, 96:3.160
 - Poverty's effect on fire risk, 96:1.104
 - Residential fire statistics and safety information, 98:5.112
 - School fire safety holds lessons for other occupancies, 97:5.104
 - Summer fire hazards, 97:4.96
 - Vehicle fire statistics and fire safety information, 98:2.88
- BURNS**
- Burns and smoke compared as fire death causes, 95:1.38
 - Common products that cause severe burns, 96:1.79
 - Fire fighter injuries, 97:6.74, 75, 76
- BUS FIRES**
- Illinois, 1991, 92:4.26
- C**
- CALIFORNIA**
- Aircraft fire, Nov. 7, 1990, 91:6.74
 - Aircraft fire, Feb., 1991, 92:6.76
 - Aircraft fire, July, 1994, 95:6.110
 - Aircraft hangar fire, 1994, 95:5.36
 - Amusement park fire, 1993, 94:3.28
 - Apartment building fire, 1990, 91:5.26
 - Apartment building fire, 1996, 97:3.30
 - Apartment building fires, 1997, 98:5.15
 - Apartment building under construction, 1997, 98:2.18
 - Apartment complex fire, Nov. 10, 1990, 91:6.73

NFPA Journal
10 Year Index 1987-1997

Apartment complex fire, 1992, 93:5.35
Apartment complex fire, 1993, 94:2.28
Board and care facility fire, 1993, 94:2.30
Building-under-renovation fire, 1991, 92:5.26
Catastrophic fires
Aircraft, Nov. 26, 1993, 94:5.108
Aircraft, Dec. 15, 1993, 94:5.106
Apartment building, Apr. 26, 1993, 94:5.96
Apartment building, Sept. 7, 1991, 92:4.69
Apartment building, May 3, 1993, 94:5.95
Apartment building, June 6, 1994, 95:5.59
Apartment building, Oct. 14, 1995, 96:5.93
Apartment building, Feb. 6, 1996, 97:5.49
Apartment building, Dec. 13, 1997, 98:5.46
Automobile, Dec. 28, 1996, 97:5.55
Board and care facility, Oct. 3, 1995, 96:5.97
Boat, Nov. 16, 1991, 92:4.73
Dwelling, Aug. 3, 1992, 93:5.64
Dwelling, Nov. 29, 1994, 95:5.62
Dwelling, May 29, 1995, 96:5.91
Dwelling, Dec. 14, 1995, 96:5.92
Dwelling, Dec. 19, 1996, 97:5.51
Dwelling, April 26, 1997, 98:5.45
Dwelling fire, June 1, 1997, 98:5.49
Manufactured home, Dec. 30, 1997, 98:5.50
Manufacturing plant, Nov. 15, 1997, 98:5.53
Motor home, July 30, 1990, 91:4.72
Motor vehicle, Jan. 23, 1990, 91:4.70
Motor vehicle, Oct. 2, 1990, 91:4.72
Motor vehicle, Nov. 29, 1991, 92:4.73
Motor vehicle, Dec. 25, 1991, 92:4.73
Motor vehicle, March 3, 1994, 95:5.68
Motor vehicle, June 18, 1995, 96:5.97
Motor vehicle, June 23, 1995, 96:5.100
Motor vehicle, June 27, 1995, 96:5.100
Motor vehicle, Sept. 9, 1995, 96:5.100
Motor vehicle, Sept. 10, 1995, 96:5.100
Motor vehicle, May 4, 1997, 98:5.55
Runway aircraft collision, fire, Feb. 1, 1991, 92:4.72
Structure fires due to civil disturbance, April 29-May 1, 1992, 93:5.67
Underground electrical vault, July 12, 1990, 91:4.69
Vacant dwelling, July 22, 1990, 91:4.67
Wildland, Oct. 20, 1991, 92:4.72
Wildland/urban interface, Nov. 2, 1993, 94:5.108
Condominium complex fire, 1990, 91:6.24
Detention facility fire, 1992, 93:5.36
Dwelling fire, 1991, 92:4.26, 92:6.28
Dwelling fire, 1992, 93:4.25
Dwelling fire, April, 1992, 93:6.79
Dwelling fire, Sept., 1992, 93:6.81
Dwelling fire, 1995, 96:2.23, 96:3.36
Dwelling-under-construction fire, 1993, 94:3.27
Earthquake, Northridge, Jan. 17, 1994, 95:3.52
Electric generating plant fire, Jan. 10, 1990, 91:6.76

NFPA Journal
10 Year Index 1987-1997

Electric power conversion facility fire, Oct., 1993, 94:6.92
Fatal apartment building fire, 1997, 98:4.19
Fatal dwelling fire, 1997, 98:5.16
Fatal fires
 Aircraft, Dec., 1994, 95:6.110
 Apartment building, 1990, 91:4.26
 Apartment building, Nov., 1993, 94:6.89
 Automobile fire, 1990, 91:2.32
 Board and care facility, 1996, 97:1.27
 Dwelling, 1994, 95:2.30
 Dwellings, 1995, 96:1.23, 96:6.22
 High-rise office building fire, May 4, 1988, 92:5.56
 Motor vehicle fire, 1995, 96:1.21
 Paint plant explosion, fire, 1991, 92:4.28
 Structure fires due to civil disturbances, April 29-May 1, 1992, 93:6.81
 Test facility fire, 95:4.40
 Wildland fire, Aug., 1992, 93:6.88
 Wildland/urban interface fires, Nov., 1993, 94:6.99
Fatal manufacturing plant fire, 1997, 98:6.22
Fatal propane truck/clubhouse fire, 1997, 98:2.19
Garage, residential, fire, 1992, 93:6.29
Health clinic fires, 1995, 96:1.24
High-rise office building fire, Feb. 15, 1992, 92:5.56
Hotel fire, 1990, 91:6.24
Hotel fire, 1993, 94:2.28
Housing for elderly fire, 1995, 96:5.24
Library fire, Jan., 1992, 93:6.79
Manufacturing plant fire, 1990, 91:6.25
Manufacturing plant fire, Aug. 26, 1997, 98:6.84
Manufacturing plant fire, Jan. 12, 1990, 91:6.75
Manufacturing plant fire, 1992, 93:4.27
Manufacturing plant fire, Jan., 1992, 93:6.84
Manufacturing plant fire, 1993, 94:4.31, 94:6.36
Manufacturing plant fire, 1994, 95:4.40
Manufacturing plant fire, March, 1994, 95:6.106
Manufacturing plant fire, April, 1994, 95:6.107
Manufacturing plant fire, 1995, 96:6.23
Manufacturing plant fires, 1997, 98:2.20, 3.41, 4.21, 6.21
Medical research laboratory fire, 1990, 91:5.30
Mixed-occupancy fire, 1990, 91:6.25
Motion picture studio/manufacturing plant fire, Nov. 6, 1990, 91:6.74
Motor home fire, 1994, 95:5.36
Motor vehicle repair shop fire, 1990, 91:2.30
National forest fire, June 27, 1990, 91:2.30
Naval facility incident, 1993, 94:3.29
Office building fire, 1991, 92:1.23
Office building fire, March, 1991, 92:6.78
Office building fire, 1993, 94:5.30
Office building fire, 1994, 95:5.35
Office building fire, 1995, 96:1.21
Oil refinery fire, Oct., 1992, 93:6.82
Oil refinery fire, Jan., 1995, 96:6.63
Radio station fire, 1994, 95:4.40
Refinery fire, Jan. 21, 1997, 98:4.21

NFPA Journal
10 Year Index 1987-1997

- Restaurant fire, 1990, 92:3.34
 - Restaurant fire, 1992, 93:4.28, 93:5.35
 - Restaurant fires, 1997, 98:3.36, 4.22
 - Sawmill/manufacturing plant fire, March, 1991, 92:6.79
 - School fire, 1991, 92:6.29
 - School fire, 1992, 93:4.28
 - School fire, 1997, 98:1.21
 - Shed fire, 1991, 92:6.26
 - Shopping mall fire, 1993, 94:6.35
 - Storage facility fire, 1992, 93:6.29
 - Store fire, 1992, 93:2.19, 93:5.38
 - Store fire, 1995, 96:5.26
 - Store fire, 1996, 97:1.27
 - Store fire, 1997, 98:4.21
 - Supermarket fire, 1990, 91:6.26
 - Theater/lodge fire, 1995, 96:1.24
 - Theater fire, 1996, 97:3.29
 - Warehouse fire, 1990, 91:1.61, 91:6.73
 - Warehouse fire, 1991, 92:1.23, 93:1.28
 - Warehouse fire, 1992, 93:4.26
 - Warehouse fire, 1996, 97:6.23
 - Warehouse fire, Sept. 25, 1996, 97:6.57
 - Wildland fire, Aug. 6, 1990, 91:6.74
 - Wildland fire, 1992, 93:4.28
 - Wildland fire, Sept., 1992, 93:6.88, 93:6.89
 - Wildland fire, Aug. 13, 1997, 98:6.92
 - Wildland/urban interface fires, June 27, 1990, 91:1.59, 91:6.73, 74, 75
 - Wildland/urban interface fire, Oct., 1991, 92:6.74
 - Wildland/urban interface fire, Aug., 1992, 93:6.89
 - Wildland/urban interface fires, Oct., 1993, 94:6.99
 - Wildland/urban interface fire, June, 1994, 95:6.111
 - Wildland/urban interface fires, Aug., 1994, 95:6.111
 - Wildland/urban interface fire, Sept. 27, 1997, 98:6.92
- CAMPING TRAILER FIRES**
- Catastrophic
 - Alabama, Dec. 6, 1997, 98:5.56
 - Ohio, Nov. 29, 1997, 98:5.56
 - Ohio, 1996, 97:6.20
- CANADA**
- Apartment building fire, Alberta, 1990
 - 5.26
 - Detention facility fire, St. John, New Brunswick, June 21, 1977, 94:5.50
 - Hazardous materials response, 92:1.38
 - Motor vehicle repair shop fire, Ontario, 1989, 91:1.28
 - Tire fire, Ontario, 1990, 91:1.50
 - Tire fire, Quebec, 1990, 91:1.55
- CANDLES**
- Catastrophic fires caused by
 - Dwelling fires, 93:5.64, 94:5.97, 95:5.53, 59, 97:5.49, 98:5.49
 - Manufactured home fire, possible cause, 98:5.46
 - Vacant dwelling fire, 93:5.67
 - Dormitory fire caused by, 91:2.29
 - Fatal fires caused by
 - Dwelling fires, 95:1.34, 95:6.37, 96:6.22, 97:5.21, 98:5.17

NFPA Journal
10 Year Index 1987-1997

- Manufactured home fire, 91:4.26
- Residential fires caused by, statistics and fire safety information, 98:3.160
- CARBON DIOXIDE EXTINGUISHING SYSTEMS**
 - Electrical fire extinguished by, 95:5.35
 - Lacked sufficient agent for extinguishment, 95:6.108
 - Nuclear energy plant fire extinguished by, 95:6.102
 - Overpowered by fire, 94:6.94
 - Shipboard fire extinguished by, 92:6.48
 - Shipboard system discharges accidentally, kills two, 96:2.83
- CARBON MONOXIDE**
 - Causes, symptoms, and prevention of CO poisoning, 97:6.120
 - Fire fighter fatalities caused by, 91:4.53
 - Fire fighter injuries caused by, 97:6.75
 - Questions on gas, its effects, and detectors answered, 98:5.20
- CARPETS AND RUGS**
 - Carpet plant fire, Georgia, Jan., 1995, 96:6.62
 - Cigarettes, ignited by; catastrophic fire cause, 92:4.68
 - Cord, damaged, ignited by, 94:5.28
 - Cutting torch, ignited by, 94:6.97
 - Extension cord, ignited by, 95:6.37
 - Extension cord, ignited by; catastrophic fire cause, 92:4.67
 - Floor furnace, ignited by; catastrophic fire cause, 91:4.69
 - Kerosene heater fuel spill, ignited by, 98:6.23
 - Smoking materials, ignited by; catastrophic fire, 95:5.56
 - Unintentionally ignited; catastrophic fire cause, 96:5.93
- CARSON, MARGARET D.**
 - Profile of, 92:2.20
- CASTINO, G. THOMAS**
 - Profile of, 93:3.20
- CATASTROPHIC FIRES, U. S.**
 - 1990, study of, 91:4.60
 - 1991, study of, 92:4.62
 - 1992, study of, 93:5.56
 - 1993, study of, 94:5.88
 - 1994, study of, 95:5.48
 - 1995, study of, 96:5.86
 - 1996, study of, 97:5.46
 - 1997, study of, 98:5.42
- CEILING. *See also* CONCEALED SPACES**
 - Catastrophic fires**
 - Ignites ceiling coverings, 92:4.67
 - Spread over tiles, 91:4.64
 - Ceiling tiles ignite, suspended ceiling fails, 92:6.31
 - Collapse**
 - Hampers fire fighting, 94:6.89, 96:3.35
 - Prevents rescue, 93:5.64
 - Requires defensive attack, 98:1.21
 - Spreads fire, heat, smoke, 92:6.76
 - Cutting torch ignites material, 95:6.108
 - Dropped**
 - Fire spread above, 96:5.91
 - Fire started above, 94:6.95
 - Fire spread through, 91:5.28, 92:4.25, 70, 92:5.30, 94:6.90, 93, 96:2.23, 96:3.35
 - Fire spread to structural members in, 95:6.100

NFPA Journal
10 Year Index 1987-1997

Fire started in, 98:1.21
Multiple ceilings hide fire, limit access, 92:3.31
Plywood-covered, contributes to fire spread, 96:5.96
Vaulted design factor in fire spread, 95:6.107

CHAPEL HILL, NORTH CAROLINA

Fraternity house fire, May 12, 1996, 96:5.61

CHASES

Fire spread through, 94:5.96, 94:6.89, 97:5.49
Fire started in, 97:6.58

CHEMICAL FIRES

Calcium metal/water reaction cause fire, 94:6.95
Chlorine/antifreeze react, cause warehouse fire, 98:5.18
CMDP spontaneous ignition causes fire, 91:5.30
Foam rubber production chemicals react, cause fire, 96:6.23
Hydrocarbon-caustic solution reaction possible cause of explosion/fire, 91:6.78
Motor oil/pool chemicals react, cause fire, 96:6.70
Muriatic acid/pool chemicals react, ignite fatal fire, 98:3.36
Oxidizers/pool chemicals, factor in retail store fire, 97:6.54
Oxidizing pool and spa chemicals present hazard in warehouse stores, 98:1.50
Oxidizing pool chemical storage in warehouse stores needs special attention, 98:4.44
Peroxide/polyurethane chain reaction, 91:5.28
Polyol level in pump drops, causes exothermic reaction, 98:3.41
Potassium superoxide reacts with organic material, 95:6.38
Sodium hydrosulfite/aluminum powder react, cause explosion, 96:5.94
Sodium/water reaction, causes flash fire, 97:5.23
Waste chemicals in dumpster react, ignite waste products, 97:5.24

CHEMICAL PLANT FIRES

California, 1992, 93:4.27
Catastrophic
Iowa, Dec. 13, 1994, 95:5.66
Louisiana, May 1, 1991, 92:4.70
Minnesota, Nov. 17, 1993, 94:5.105
Ohio, May 27, 1994, 95:5.66
South Carolina, June 17, 1991, 92:4.70
Texas, July 5, 1990, 91:4.67
Fatal, Ohio, 1990, 91:3.31
Louisiana, May, 1991, 92:6.75
Louisiana, April 15, 1997, 98:6.84
Louisiana, July, 1992, 93:6.83
Minnesota, Feb. 6, 1997, 98:6.85
Minnesota, Nov. 17, 1993, 94:5.105
North Carolina, 1995, 96:3.39
South Carolina, June, 1991, 92:6.80
Texas, March, 1991, 92:6.75
Texas, Jan., 1992, 93:6.83
Texas, July, 1995, 96:6.64
Texas, Aug., 1995, 96:6.64
Utah, Feb. 1, 1997, 98:6.86

CHEMICAL TRANSPORTATION EMERGENCY CENTER. *See* CHEMTREC

CHEMICAL WAREHOUSE FIRES

Arkansas, May 8, 1997, 98:5.53
North Carolina, 1992, 93:2.21
Texas, June/July, 1995, 96:6.66

CHEMICALS

NFPA Journal
10 Year Index 1987-1997

Federal haz-mat regulations cover intrastate shipments of agricultural chemicals, 98:5.25
CHEMTREC

Vital link for chemical emergencies, 93:3.86

CHESTER COUNTY, PA.

Emergency response system upgrade, 94:2.62

CHICAGO, ILLINOIS

Space program technology applied to tank truck fires by NASA, NFPA, Chicago Fire
Dept. partnership, 98:2.52

CHIEF'S BRIEFING COLUMNS

Arson's terrible toll, 95:2.112

Burdens of command responsibilities, 95:4.23

Developing professional programs for leadership training, 93:4.14

Fire department and elderly agencies focus on seniors' fire safety, 94:3.13

International Association of Fire Chiefs includes retirees, 94:6.19

Juvenile firesetters need social services, 95:3.23

Labor relations eased by seeing both sides, 94:2.13

Leadership requires political savvy, 95:6.21

Listening and responding to fire service members, 94:1.13

Mission statement core of operating plan, 94:4.15

Networking with external groups, 94:5.17

New Orleans fire chief Bill McCrossen retires, 93:5.18

Officer training is key to fire service's success, 93:3.26

Public fire safety education is long-term answer to fire loss, 93:6.14

Truck company duties need emphasis in training, planning, 95:5.19

Urban Fire Forum discusses global trends, 95:1.104

Urban problems confront fire service, 93:2.14

CHILDREN

Playing with charcoal lighter, ignites fatal fire, 98:4.19

Playing with chemicals, ignite fatal fire, 98:3.36

Playing with fire, ignite fatal fire, 96:2.23, 98:1.23

Playing with fire, ignited fatal fire, 95:1.32

Playing with open-flame device, ignite catastrophic fire, 94:5.100, 96:5.92

Safe Place programs include fire stations, 94:6.128

Victims and cause of fires, statistics, 95:5.144

CHILDREN AND CIGARETTE LIGHTERS

Catastrophic fire cause, 91:4.65, 66, 92:4.70, 93:5.64, 94:5.97, 95:5.54, 97:5.50

Fatal fire cause, 91:6.24, 92:1.22, 93:4.25, 93:5.35, 93:6.28, 95:3.38, 95:4.38,
95:5.34, 95:6.36, 96:1.23, 97:5.21, 6.19, 98:3.38, 5.16

Fire cause, 91:5.26, 93:3.33, 94:1.30, 94:2.28, 95:4.37, 96:5.24, 97:6.21

CHILDREN AND FIREWORKS

Dwelling fire cause, 92:4.26

Manufacturing plant fire cause, 95:3.40

CHILDREN AND MATCHES

Catastrophic fire cause, 91:4.64, 66, 95:5.59, 96:5.92

Fatal fire, possible cause, 91:2.32

Fatal fire cause, 92:5.25, 93:1.27, 95:3.37, 97:2.22, 5.21, 98:2.18, 3.38, 5.16, 6.23

Fire cause, 91:6.24, 98:6.90

CHILDREN, UNATTENDED

Catastrophic fire victims, 91:4.65, 66, 92:4.70, 94:5.96, 95:5.54, 98:5.45

Fatal fire victims, 92:1.22, 93:2.21, 93:3.57, 93:5.36, 95:1.34, 95:4.38, 96:3.39,
98:1.23

Fire risks faced by, 93:3.54

Wildland fire ignited by, 93:6.89

CHIMNEYS

NFPA Journal
10 Year Index 1987-1997

Fire fighter fatalities related to collapse of, 94:4.66
Fire spread through, 97:5.49, 6.57
Overheated, improperly maintained, fire ignites framing, 96:6.22

CHINA

Manufacturing plant fire, Nov. 19, 1993, 94:1.48

CHRISTMAS TREE FIRES

Arizona, 1993, 94:6.34

California, 1990, 91:6.24

Catastrophic

Artificial tree, Michigan, Dec. 3, 1992, 93:5.64

Michigan, Dec. 22, 1990, 91:4.64

Fatal

Artificial tree, Ohio, 1992, 93:6.28

Iowa, 1991, 92:1.22

Michigan, 1993, 94:6.33

Illinois, 1994, 95:6.36

Massachusetts, Dec. 24, 1994, 95:5.54

Michigan, 1991, 92:6.28

Michigan, 1992, 93:6.28

Utah, Dec., 1993, 94:6.90

CHURCH FIRES

Connecticut, Oct., 1992, 93:6.79

Illinois, 1989, 91:1.30

Indiana, 1993, 94:4.31

Indiana, Sept., 1993, 94:6.89

Massachusetts, 1992, 93:2.21

Missouri, 1997, 98:2.19

Ohio, 1994, 95:3.39

Pennsylvania, Feb., 1995, 96:6.73

Pennsylvania, 1996, 97:5.23

Pennsylvania, Sep. 11, 1997, 98:6.92

Tennessee, 1992, 93:6.30

Texas, 1992, 93:6.30

Texas, 1996, 97:1.27

Virginia, July, 1994, 95:6.98

CIGARETTE LIGHTERS. *See also* CHILDREN AND CIGARETTE LIGHTERS

Catastrophic fire ignition source, 1990 fires, 91:4.68, 69

Fire ignition source, 93:6.87, 94:5.104

Incendiary fire ignition source, 94:5.105, 94:6.34, 95:2.31, 95:4.37, 98:4.20

Lighter fluid used to ignite fireplace fire, 96:1.23

CIGARETTES. *See also* SMOKING MATERIALS

Careless disposal of

Apartment building fire cause, 93:3.35, 96:1.22, 96:5.24, 97:3.30

Board and care facility fire cause, 94:2.30, 94:6.33

Bridge fire cause, 97:3.34

Catastrophic dwelling fire cause, 92:4.68, 69, 94:5.102, 95:5.60, 97:5.49

Catastrophic rooming house fire cause, 92:4.67

Dumpster fire cause, possible, 96:5.26

Dwelling fire cause, 96:5.25

Fatal dwelling fire cause, 94:1.31

Hospital fire cause, 98:1.24

Manufacturing plant fire cause, 95:6.107

Nursing home fire cause, 91:4.25

Office building fire cause, 96:2.24

NFPA Journal
10 Year Index 1987-1997

Store fire cause, 92:1.21, 94:6.35

Warehouse fire cause, 96:6.66

Wildland fire cause, 93:6.89

Careless use of

Apartment complex fire cause, 94:1.32

Apartment fire cause, 91:3.26, 92:3.34, 97:2.22

Catastrophic apartment building fire cause, 98:5.49

Catastrophic dwelling fire cause, 91:4.65, 91:4.66, 93:5.64

Catastrophic manufactured home fire, possible cause, 98:5.46

Dwelling fire cause, 97:1.25

Elderly housing fire cause, 96:5.24

Fatal apartment building fire cause, 91:2.29

Fatal board and care facility fire cause, 97:1.27

Fatal dwelling fire cause, 94:1.31, 98:1.23, 5.16

Fireworks plant fire cause, 93:3.35

Group home fire cause, 92:1.26, 95:6.35

Limited-care facility fire cause, 98:4.21

Nursing home fire cause, 92:2.26, 96:4.24, 98:1.24

Rooming house fire cause, 97:6.19

Shed fire, possible cause, 93:2.20

Incendiary fire started by, 97:6.54

Statistics on cigarette use, fires, 95:3.160

CINCINNATI, OHIO

Crown Coliseum arena updates fire protection system, 98:3.120

CIVIL DISTURBANCES

Rioters burn shopping mall, impede fire fighters, Nevada, 1992, 93:2.19

Rioters damage/destroy 862 structures by incendiary fires, California, April 29-May 1, 1992, 93:5.67, 93:6.81

CLOTHING FIRES

Catastrophic

Flash fire ignites clothes, 91:4.67

Laundry and holding bins ignited, 97:5.54

Stored clothing, 96:5.92, 97:5.50

Extension cords ignite clothing placed on cord, 97:5.51

Fatal

Cigarettes ignite clothing, 97:1.25, 1.27, 98:6.23

Clothes drying near gas furnace ignite, 98:3.38

Lamp ignites clothing, 91:4.25

Stored clothing, 97:2.22

Stove ignites clothing, 98:2.16, 5.16

Wood stove explosion ignites clothing, 97:6.20

Worker spills molten metal, 91:1.31

Fuel in aircraft crash fire, ignited by, 96:5.99

Gas-fired furnace, ignited by, 95:5.54

Lamp, ignited by, 94:6.33

Laundry basket of clothes ignited by kerosene heater, 97:5.49

Match, dropped, ignited by, 96:5.24

Smoking materials, ignited by, 95:5.64, 96:5.97

Space heater, ignited by, 95:5.53

Stored clothing

Catastrophic fire, factor in, 96:5.92, 97:5.50

Fatal fire, factor in, 97:2.22

Fire, factor in, 97:6.22

Stove burner, ignited by, 96:3.39

NFPA Journal
10 Year Index 1987-1997

CLUB FIRES

- California, 1997, 98:2.19
- Catastrophic
 - Georgia, Dec. 12, 1990; vacant building, 91:4.68
 - New York, March 25, 1990, 91:4.67
- Cocoanut Grove fire, five eyewitnesses remember, 91:3.74
- Florida, 1993, 94:5.30
- Illinois, 1994; country club, 95:3.39
- Illinois, Oct. 18, 1996, 97:6.59
- Indiana, 1992; athletic club, 92:6.31
- Maryland, Aug., 1993, 94:6.89
- Michigan, 1990, 91:6.23
- Oklahoma, Jan., 1994, 95:6.98
- Texas, 1991; nightclub, 92:6.25
- Washington, May 11, 1990, 91:6.77
- Wisconsin, 1993, 94:3.29

COAL MINE FIRES

- Catastrophic
 - Kentucky, July 31, 1990, 91:4.69
 - Virginia, Dec. 7, 1992, 93:5.66
 - West Virginia, March 19, 1992, 93:5.67, 93:6.82
- Illinois, Sept. 1991, 92:6.77

COCKLOFTS. See CONCEALED SPACES

COCOANUT GROVE FIRE

- Five eyewitnesses remember, 91:3.74

CODES AND STANDARDS. See also CODES ON THE FIRELINE COLUMNS; IN COMPLIANCE COLUMNS; NFPA CODES AND STANDARDS

- Basis-for-design reports help authority having jurisdiction, building owner, 95:4.24
- Development process and future trends, 91:4.36
- Elevator recall and shut down requirements increase safety, 97:5.64
- Evaluating equivalencies and exceptions to standards, 95:1.16
- Federal law requires agencies to use voluntary consensus standards, 96:6.40
- Fire models to evaluate alternative designs, 95:2.68
- High technology detectors require new standards, 95:5.42
- International electrical standards, developing, 94:1.34
- International standards, developing consensus for, 94:1.36
- Making performance-based codes work, 97:1.73
- NFPA and ICC collaborate to develop one national model fire code, 97:4.36
- NFPA and International Code Council work on national fire code, 96:5.46
- Nursing home fire verifies authority having jurisdiction/engineers sprinkler design, 95:2.85
- Passive fire protection systems, 97:2.30
- Performance-based codes
 - Benefits of, 97:1.72
 - Designing buildings for, 95:5.20
 - Development of, 94:6.16, 95:2.16, 96:1.46, 96:3.43
 - Existing buildings, performance objectives for, 95:6.22
 - Existing codes, based on, 95:3.24
 - North America, use in, 94:3.70
 - U. S. Department of Energy, adopted by, 97:3.94
- Regulations affect use of new construction methods, 96:2.32
- Residential sprinklers requirement, Scottsdale, Arizona, analysis, 97:4.40
- Stratosphere Tower (Las Vegas) designed using performance and prescriptive codes, 97:3.72

NFPA Journal
10 Year Index 1987-1997

- U. S. cable/wire manufacturers promote NEC over IEC as European standard, 98:4.64
- U. S. response to European economic unification and global standards, ANSI's role in, 91:6.54

CODES ON THE FIRELINE COLUMNS

- Consensus requirement can slow adoption of innovations, 96:2.29
- Evaluating department's initial attack capability, 96:5.29
- Fire service role in code-making, 96:1.27
- Marketing residential sprinklers, 96:4.27
- New Zealand fire service operation and code development provide insights, 96:3.43
- Regional fire code development committees provide input to NFPA, 96:6.27

COLLEGE BUILDING FIRES. *See also* DORMITORY FIRES

- Classroom building, Indiana, 1994, 95:5.35
- Classroom building, Kentucky, 1994, 95:5.35
- Fraternity house, Chapel Hill, North Carolina, May 12, 1996, 96:5.61, 97:5.50
- Fraternity house, Ohio, 1996, 97:6.21
- Fraternity house, Pennsylvania, 1992, 93:1.27
- Fraternity house, Rhode Island, 1994, 95:3.37
- Laboratory, Texas, 1996, 97:5.23
- Mixed-use building, Kansas, June, 1991, 92:6.78
- Office/classroom building, Georgia, Aug., 1995, 96:6.73
- Students need fire safety education, 97:5.34
- University bell tower, West Virginia, 1993, 94:4.30

COLORADO

- Apartment building fire, 1997, 98:4.20
- Apartment building fire, July 18, 1997, 98:6.90
- Catastrophic fires
 - Board and care facility, March 4, 1991, 92:4.70
 - Hotel, Jan. 27, 1997, 98:5.49
 - Wildland, July 3, 1994, 95:2.51, 95:5.67
- Fatal fires
 - Automobile repair shop, 1996, 97:1.26
 - Manufactured home, 1997, 98:1.23
 - Office building, Sept. 28, 1992, 93:2.33
- Fuel tank storage facility fire, Nov. 25, 1990, 91:6.73
- Resort fire, 1992, 93:1.25
- Warehouse fire, July 23, 1997, 98:6.87
- Warehouse fire, Nov., 1992, 93:6.87

COLORADO SPRINGS, COLO.

- Computer mapping used by fire service, 95:1.84

COMBUSTIBLE PRODUCTS

- Effectiveness of current product labeling systems, 94:1.71

COMMERCIAL OCCUPANCIES. *See also* specific occupancies

- Site testing smoke detectors, 98:3.110

COMMUNICATIONS. *See* FIRE SERVICE COMMUNICATIONS

COMMUNICATIONS INDUSTRY

- Fire protection for, 92:2.32

COMMUNITY CENTER FIRES

- Pennsylvania, 1996, 97:5.23

COMPARTMENTATION

Lack of

- Kennel fire, factor in, 93:2.20
- Library fire, factor in, 93:6.79
- Sawmill fire, factor in, 92:6.79
- Warehouse fire, 92:6.78

NFPA Journal
10 Year Index 1987-1997

- Through-penetration protection systems, 94:1.54
- COMPRESSED NATURAL GAS
 - Vehicles fueled by, handling incidents involving, 94:4.84
- COMPRESSED NATURAL GAS FIRES
 - Cylinder ruptures, causing explosion and fire, 94:4.30
 - High-pressure tanks being vented, fuel ignited by static discharge, 94:4.29
- COMPUTER MODELS. *See* FIRE MODELS
- COMPUTER SOFTWARE
 - Fire alarm software requires careful management, 95:1.54
 - Fire protection community, software useful to, 97:1.50
 - Fire service software, 91:3.90
 - Responders linked to hazardous materials databases by software, 97:3.66
- COMPUTER-AIDED DISPATCH
 - Los Angeles implements new CAD system, 94:2.66
- COMPUTERS AND RELATED EQUIPMENT
 - Electronic equipment room fires, loss data, 97:3.100
 - Fire in uninterrupted power supply spreads to cables, 95:2.30
 - Fire protection for, 92:2.32
 - Fire protection information available on Internet, 96:6.44
 - Fire service use of, 92:2.32, 95:1.76
 - Fuel high-rise office building fire, 92:5.56
 - Internet's fire protection applications, 95:6.41
- CONCEALED SPACES
 - Above door, fire started in, 98:5.15
 - Attic
 - Fire spread into, 95:5.64, 96:3.35, 96:5.25, 96:6.64, 65, 97:2.22
 - Fire spread through, 98:6.22
 - Fire started in, 96:1.24, 97:2.23
 - Attic/roof
 - Fire spread into, 95:4.37, 40, 95:6.98
 - Fire started in, 94:4.29
 - Ceiling
 - Catastrophic hotel fire started in, 91:4.64
 - Fire spread into, 92:6.78, 95:5.64, 95:6.99, 104, 96:2.23, 96:3.35, 96:5.91, 97:6.22, 53
 - Fire spread through, 98:1.21, 98:6.85, 6.90
 - Fire started in, 94:6.93
 - Flashover, factor in, 92:6.31
 - Ceiling/floor
 - Fire spread into, 95:4.37
 - Fire started in, 95:5.56, 97:5.23, 6.58, 98:6.92
 - Ceiling/roof
 - Fire spread into, 93:5.35, 36, 93:6.30, 79, 94:5.97, 94:6.89, 95:5.59, 95:6.107
 - Fire spread through, 98:1.21, 2.19, 5.16
 - Fire started in, 95:6.106, 98:6.84
 - Cockloft
 - Catastrophic fire spread through, 91:4.65
 - Fire spread into, 95:4.39
 - Fire spread through, 94:5.98, 98:1.21
 - Fire started in, 94:6.90
 - Fire spread into, 91:6.77, 93:5.64, 93:6.81, 94:6.36, 95:6.108
 - Fire spread through, 91:4.67, 92:3.31, 92:6.78, 92:6.79, 94:5.95, 94:6.89, 98:5.45, 49, 6.24, 89
 - Fire started in, 98:2.19

NFPA Journal
10 Year Index 1987-1997

Floor

- Fire spread into, 93:3.36, 93:6.79
- Fire spread through, 94:6.93
- Fire started in, 95:5.54

Roof

- Fire spread into, 95:6.107, 96:2.23
- Fire spread through, 94:6.94, 95, 98:4.19, 22, 6.22, 90
- Fire started in, 96:1.24

Walls

- Fire spread into, 94:5.96, 96:2.24
- Fire spread through, 93:4.33, 97:6.19
- Fire started in, 91:4.67, 97:5.49

CONDOMINIUM FIRES

- California, 1990, 91:6.24
- Delaware, Feb. 17, 1996, 97:6.57
- Illinois, 1990, 91:6.23
- Illinois, Nov. 17, 1996, 97:6.58
- North Carolina, Sept., 1993, 94:6.90
- Texas, Dec. 14, 1996, 97:6.58

CONFERENCE CENTER FIRES

- New Jersey, 1993, 94:2.30

CONFINED SPACES

- OSHA regulation aims to reduce incidents in, 94:5.80
- Stockroom fire, 94:6.91

CONGRESSIONAL FIRE SERVICES INSTITUTE

- Fire services/safety publicized by, 98:1.31

CONNECTICUT

- Apartment building fire, 1996, 97:2.21
- Bridge fire, 1996, 97:3.34
- Catastrophic fires
 - Aircraft, April 27, 1994, 95:5.67
 - Board and care facility, Feb. 10, 1996, 97:5.53
 - Dwelling, Feb. 16, 1991, 92:4.67
- Church fire, Oct., 1992, 93:6.79
- Detention facility fire, July 7, 1977, 94:5.51
- Dwelling fire, 1991, 92:4.26
- Fatal apartment building fire, 1996, 97:5.21
- Library fire, 1996, 97:1.26
- Manufacturing plant fire, 1996, 97:4.22
- Manufacturing plant fire, 1997, 98:3.42
- Marina fire, 1990, 91:6.26
- Mill fire, 1995, 96:2.25
- Restaurant fire, 1996, 97:4.22
- Store fire, 1993, 94:6.35

CONSTRUCTION, FIRE-RESISTIVE

- Limited fire spread, apartment building fire, 93:3.35

CONSTRUCTION METHODS

- Balloon construction, factor in fire spread, 97:6.58
- Openings in construction, factor in fire spread, 97:6.58

CONVEYORS

- Friction between belt and roller ignites fire, 94:6.92
- Heat produced by belt ignites combustibles, dust, 98:6.91
- Hot slag drops onto freezer conveyor, ignites freezer, 98:6.84
- Mechanical failure causes grain to ignite, 92:4.28

NFPA Journal
10 Year Index 1987-1997

- Mechanical failure causes sugar dust to ignite, 97:6.49
- Overheated bearing ignites cardboard, 96:6.23
- Welding sparks ignite belt, 96:6.68
- COOKING-AND-HEATING EQUIPMENT FIRES. *See* HEATING-AND-COOKING EQUIPMENT FIRES
- COOLING TOWER FIRES
 - Rooftop tower of high-rise office building, Massachusetts, 1991, 92:5.28
- CORRECTIONAL FACILITY FIRES. *See* DETENTION FACILITY FIRES
- COX, PHIL
 - Profile of, 96:4.36
- CRAWFORD, JIM
 - Profile of, 93:5.23
- CROWDED BUILDINGS
 - Catastrophic fire, factor in, 94:5.102
- CUTTING AND WELDING OPERATIONS. *See* WELDING AND CUTTING OPERATIONS
- D
- DALY, WENDY L.
 - Profile of, 94:3.20
- DANBURY, CONN.
 - Detention facility fire, July 7, 1977, 94:5.51
- DELAWARE
 - Catastrophic fires
 - Dwelling, April 10, 1990, 91:4.66
 - Dwelling, Jan. 20, 1993, 94:5.97
 - Condominium fire, Feb. 17, 1996, 97:6.57
 - Detention facility fire, 1990, 91:3.25
- DELUGE SYSTEMS
 - Satisfactory performance, refinery fire, 97:6.49
 - Unsatisfactory performance; activated after water outage, cause major damage, 94:3.29
- DENVER, COLO.
 - Fatal office building fire, Sept. 28, 1992, 93:2.33
 - Fire department is progressive, innovative, 95:3.118
 - Tank farm fire, Nov. 25, 1991, 92:1.60
- DETECTION SYSTEMS
 - Automatic, did not cover area of fire origin, 92:5.28
 - Intelligent systems eliminate false alarms without compromising protection, 97:6.78
 - Life safety system installed at Winterthur Museum, 92:5.63
 - Not a factor in fire
 - Not in service, 95:5.35
 - Not operational due to poor maintenance, 95:6.104
 - Optical flame system design, 95:3.105
 - Unsatisfactory performance, 98:6.92
- DETECTORS
 - Carbon monoxide detector questions answered, 98:5.20
 - High technology requires new standards, integration with building controls, 95:5.42
 - Lack of detectors allowed school fire to spread, 98:1.21
 - Motion detector sets off alarm in library fire, 97:1.26
 - NFPA 72, *The National Fire Alarm Code*, consolidates detection standards, 93:5.70
 - Not a factor in fire
 - Absence of detectors; catastrophic dwelling fire, 94:5.97
 - Fire above detectors, 95:6.99, 97:6.52
 - Fire on building exterior, 98:5.16
 - Methane gas detectors, disabled, in mine explosion/fire, 93:5.66

NFPA Journal
10 Year Index 1987-1997

- Motion detectors covered with tape, fail to detect fire, 96:6.24
- Rendered inoperable by explosion, 91:6.74
- System not operational, catastrophic apartment building fire, 94:5.95
- Sample training exercise for detector placement, 96:4.49
- Satisfactory performance, 94:6.95, 96:6.62, 69, 72, 73
- DETECTORS, FLAME
 - Designing optical detection systems, 95:3.105
- DETECTORS, HEAT
 - Residential detectors, performance in fire tests, 93:1.48
- DETECTORS, HEAT, NOT A FACTOR IN FIRE
 - Not in service, 93:6.88
- DETECTORS, HEAT, SATISFACTORY PERFORMANCE, 92:5.30, 93:2.21, 93:5.37, 64, 66, 93:6.79, 94:6.90, 96:6.22, 98:1.24, 2.20, 5.53, 6.85, 88
- DETECTORS, HEAT, UNSATISFACTORY PERFORMANCE, 91:6.77, 92:4.70, 93:6.87, 98:6.92
- DETECTORS, SMOKE
 - Air sampling detectors, overview of, 92:3.80
 - Blocked by interior renovations, delayed detection, 92:6.26
 - Control system used for safe elevator recall, 93:3.28
 - Fire prevention week theme, 1992, 92:5.68
 - Free detector distribution program saves residential occupants, 98:3.38
 - Inspection, testing, and maintenance to ensure reliability, 96:5.68
 - Insufficient number, location, factors in catastrophic fire, 91:4.68
 - Location delayed notification, factor in catastrophic fire, 91:4.69
 - Many U. S. detectors not operable, most due to batteries missing or dead, 98:3.98
 - Nuisance alarms: field study in Native American community, 96:5.65
 - Preventing nuisance alarms, 93:5.16
 - Questions on location and type answered, 98:6.26
 - Residential detectors, performance in fire tests, 93:1.48
 - Site testing in commercial occupancies, 98:3.110
 - U. S. Consumer Product Safety Commission study of detector failure, 97:5.40
 - U. S. experience with, 94:5.36
- DETECTORS, SMOKE, NOT A FACTOR IN FIRE
 - Aircraft crash, 92:6.79
 - Batteries missing or dead, 91:4.26, 91:5.26, 92:4.67, 92:4.68, 68, 92:5.25, 92:6.28, 93:1.27, 93:2.22, 93:4.25, 93:5.35, 36, 62, 64, 93:6.28, 94:1.30, 94:5.96, 97, 98, 100, 102, 95:1.34, 95:4.37, 38, 95:5.34, 54, 56, 60, 95:6.37, 96:2.24, 96:5.24, 93, 96, 96:6.22, 97:3.29, 30, 5.21, 51, 98:1.23, 5.15, 16, 17, 46, 49
 - Battery disconnected, 98:3.38
 - Battery incorrectly installed, 93:5.64
 - Defective, 97:4.19
 - Delayed operation, 94:5.28
 - Disconnected, 91:3.26, 96:5.91, 92, 97:2.22
 - Electrical system shorted, 97:5.49
 - Explosion, 92:6.28
 - Fire above detectors, 94:4.29, 94:6.95, 95:6.106, 96:6.24
 - Fire extinguished quickly, 98:5.17
 - Fire on exterior of building, 94:6.90
 - Fire spread too fast, 92:2.28
 - Frequent activation of alarms in absence of fire led residents to ignore alarm, 93:1.27
 - Hearing impaired person may not have heard detector, 93:2.22
 - Improperly installed, 92:3.34
 - Intoxicated occupants do not respond, 96:5.24
 - Not in service, 91:3.27, 93:6.88, 94:4.32, 95:4.38, 95:6.35, 37, 99, 98:5.45

NFPA Journal
10 Year Index 1987-1997

- Not installed, 98:5.17, 5.49
- Not located in area of origin, 94:6.91, 96:5.97, 97:1.26, 6.22, 98:5.49, 6.89
- Power supply shut off, 95:5.54, 96:6.22
- Reason unknown, 95:5.53, 60, 97:5.52, 98:5.16
- Removed, 91:5.26, 92:3.34, 93:1.26, 95:5.60, 97:2.22, 4.19, 98:5.50
- Short circuit caused breaker to trip, 95:5.59
- DETECTORS, SMOKE, SATISFACTORY PERFORMANCE, 92:1.22, 26, 92:2.27, 92:6.28, 29, 93:3.33, 93:5.66, 93:6.28, 81, 94:1.31, 94:2.29, 30, 94:5.27, 28, 97, 100, 102, 94:6.33, 94:6.89, 90, 94, 95:2.29, 95:3.38, 95:6.107, 96:1.22, 96:2.23, 96:4.21, 24, 96:5.24, 97, 96:6.22, 23, 24, 70, 97:2.22, 5.22, 49, 50, 52, 98:1.22, 24, 2.18, 3.38, 41, 4.21, 5.53, 6.90
- DETECTORS, SMOKE, UNSATISFACTORY PERFORMANCE, 91:4.26, 68, 69, 92:6.26, 93:3.35, 94:1.31, 95:2.30, 37, 95:6.98, 107, 96:1.22, 96:5.96, 97:1.25, 98:1.21, 23, 2.16, 5.45, 49, 50
- DETENTION FACILITY FIRES
 - California, 1992, 93:5.36
 - Catastrophic, Missouri, Sept. 14, 1991, 92:4.70
 - Danbury, Conn., July 7, 1977, 94:5.51
 - Delaware, 1990, 91:3.25
 - Fire protection in correctional facilities, 94:5.49
 - Florida, 1992, 93:3.33
 - Maury County, Tenn., June 26, 1977, 94:5.50
 - North Carolina, 1996, 97:1.27
 - Ohio State Penitentiary, April 21, 1930, 94:5.54, 95:5.84
 - Pennsylvania, 1994, 95:5.33
 - St. John, Brunswick, June 21, 1977, 94:5.50
- DETROIT, MICH.
 - Catastrophic aircraft collision at airport, Dec. 3, 1990, 91:3.69, 91:4.70
 - Dwelling fire, Feb. 17, 1993, 93:3.57
 - Fatal board and care facility fire, June 2, 1992, 93:1.29
- DIESEL FUEL
 - Locomotive fuel tanks rupture, vaporized fuel ignites, factor in catastrophic fire, 97:5.54, 6.59
 - Used as fire starter, ignites fireplace fire, 92:2.29
- DINENNO, PHILIP J.
 - Profile of, 92:4.20
- DISABLED PERSONS. *See also* AMERICANS WITH DISABILITIES ACT
 - Blind, nonambulatory woman dies when smoking materials ignite bedding, 95:2.30
 - Blind man dies when stove burner ignites bathrobe, 94:2.29
 - Child in wheelchair dies in catastrophic fire, 95:5.58
 - Disabled grandmother unable to rescue children, 95:1.34
 - Fire safety principles and education for, 96:4.112
 - Hearing-impaired fire victim may not have heard smoke alarm, 93:2.22
 - Legally blind man ignites fatal fire, 97:6.20
 - Mentally disabled person sets rooming house fire, 97:1.26
 - Mentally disabled resident dies in limited-care facility fire, 98:4.21
 - Mentally disabled residents die in catastrophic fire, 95:5.62, 98:5.53
 - Physically disabled person dies in apartment building fire, 97:6.20, 98:4.19
 - Physically disabled person dies in dwelling fire, 96:5.24, 98:3.38, 5.15, 16, 50
 - Physically disabled person dies in manufactured home fire, 98:2.16
 - Physically disabled person ignites clothing while smoking, ignites catastrophic fire, 97:5.50
 - Physically disabled persons die in board and care facility fire, 96:5.96
 - Physically disabled persons die in catastrophic board and care facility fires, 97:5.52

NFPA Journal
10 Year Index 1987-1997

Physically disabled persons die in catastrophic fire, 95:5.64

DISASTER DRILLS

Logan International Airport, Boston, Mass, 91:2.54

Plane crash simulation at Hancock Tower high-rise, Boston, 93:6.35

DISASTER PLAN

Los Angeles County Fire Department's response program, 91:6.60

DISASTER RESPONSE

Congress considers natural disaster relief policy reform, 97:5.31

Oklahoma City bombing, 1995, NFPA documentation of response, 96:1.50

Oklahoma City bombing, 1995, USAR task force response to, 96:1.59

Terrorist attacks, preparation for, 96:1.54, 96:2.35

DISNEY WORLD, ORLANDO, FLA.

Fire protection systems, 96:3.119

DISPATCH. See COMPUTER-AIDED DISPATCH

DISPATCH CENTERS

Los Angeles designs state-of-the-art center, 94:2.66

DISTRICT OF COLUMBIA. See WASHINGTON, D. C.

DOMESTIC DISPUTES

Fatal fires, factor in, 1.23, 98:2.16

DOORS. See also EXITS

Blocked by refrigerator, factor in catastrophic fire, 98:5.50

Blocked by victims, factor in catastrophic fire, 97:5.51

Closed

Limited fire spread, 94:5.105

Limited heat, gas exposure, 94:6.34

Fire vented through, 98:2.18

In fire wall, fire spread through, 91:6.75

Inoperable, hamper escape in catastrophic food plant fire, 92:1.29

Jammed, factor in catastrophic motor vehicle fire, 98:5.55

Locked

Catastrophic dwelling fire, factor in, 91:4.64, 96:5.91, 98:5.45

Catastrophic dwelling fire, fire fighting operations hampered, 93:5.62

Catastrophic fire, factor in, 97:5.50, 51

Catastrophic vehicle fire, factor in, 98:5.55

Fatal apartment fire, factor in, 91:4.26, 95:3.37

Fatal fire, factor in, 97:6.19

Fire, factor in, 97:3.30

Fire fighting operations hampered by, 94:2.27, 94:6.93

Fire fighting operations hampered by; shopping mall fire, 91:1.29

Nailed shut

Catastrophic fires, factor in, 98:5.49, 5.50

Fatal fire, factor in, 95:3.37

Open

Catastrophic fire spread through, 91:4.66, 97:5.49, 52, 53

Fire spread by draft caused by, 92:5.25

Fire spread through, 91:6.24, 92:4.67, 69, 94:5.96, 100, 105, 94:6.95, 96, 95:5.64, 95:6.35, 95:6.99, 96:6.63, 96:6.64, 97:6.20, 98:5.45, 49, 6.90

Fire vented through, 91:4.67, 95:5.56, 59, 96:5.91, 93, 97:5.21, 51, 6.56, 98:5.49

Garage door, fire spread through, 92:1.21

Heat spread through, 98:5.17, 53

Lacking self-closing devices, fire spread through, 97:5.52, 53

Smoke spread through, 91:3.26, 95:5.64, 98:5.17, 53

Security bars, factor in catastrophic fire, 96:5.93, 97:5.51, 98:5.50

Steel screens hinder escape in catastrophic fire, 93:5.62

NFPA Journal
10 Year Index 1987-1997

Vehicle passenger door inoperable from interior, factor in catastrophic fire, 96:5.100
Wood, fire spread through, 92:4.67

DOORS, FIRE

Absence of, allowed fire spread, 98:6.85

Automatic

Limited fire spread, 95:1.31, 97:5.49

Operated correctly, 97:5.52

Failed to close, 93:6.85, 98:6.84

Failed to operate due to poor maintenance, 96:6.63

Field modifications of, 92:6.12

Limited/prevented fire spread, 92:4.27, 93:1.28, 94:5.105, 95:1.31, 95:6.38, 97:6.52,
98:6.92

Open, fire spread through, 93:5.64, 94:5.95, 94:6.96, 95:6.35, 103, 97:4.19, 5.21, 49,
54, 98:6.92

Overhead doors, failed to operate, factor in fire spread, 95:6.103

Removed, factor in fire spread, 94:5.95

Roll-down, limited fire spread, 95:6.38

Self-closing, prevent fire spread, 92:4.27, 97:6.21

Self-closing device deactivated, factor in catastrophic fire, 98:5.53

Self-closing devices removed, factor in catastrophic fire, 97:5.52

DORMITORY FIRES

Catastrophic

North Carolina, May 12, 1996, 97:5.50

Texas, April 19, 1993, 94:5.95

College, under renovation, Massachusetts, 1997, 98:3.42

College/university

Arizona, 1990, 91:2.29

Catastrophic, North Carolina, May 12, 1996, 97:5.50

Ohio, 1996, 97:6.21

Washington, D. C., 1990, 91:4.25

Military barracks, Washington, May 11, 1990, 91:6.77

School, Pennsylvania, April, 1994, 95:6.99

Statistics, 97:3.152

DRAFT CURTAINS

Satisfactory performance, warehouse fire, 96:4.23

DRILLING PLATFORM FIRES

Catastrophic, Louisiana, Feb. 15, 1991, 92:4.71

DRILLING RIG FIRES

Track-mounted, Wisconsin, July 9, 1991, 92:4.72

DRILLS. See DISASTER DRILLS; FIRE DRILLS

DROUGHT

Wildland fire factor, 91:1.59, 91:4.70, 91:6.74, 75, 78, 92:4.72, 92:6.74, 76, 93:3.36,
93:4.28, 93:6.88, 89, 94:5.108, 94:6.99, 95:5.67, 95:6.111, 96:2.26, 96:6.74,
97:4.21

DROWNING

Fire fighter fatalities related to, 96:4.73

DRUGS, ILLEGAL

Careless disposal of marijuana cigarette ignites apartment building fire, 97:5.22

Catastrophic dwelling fire, factor in, 94:5.102, 95:5.60

Cooking chemicals ignite apartment building fire, 95:6.36

Fatal fire, factor in, 97:6.20

DRY CHEMICAL EXTINGUISHING SYSTEMS

Delayed activation, but partly successful in restaurant fire, 95:2.31

Electrical substation plant fire extinguished with, 95:6.100

NFPA Journal
10 Year Index 1987-1997

Not a factor in fire, fire above system, 97:6.52, 97:6.53
Unsatisfactory performance, failed to operate in restaurant fire, 97:6.22

DRYING OVENS

Dust and lacquer in vent system, ignited by heat source, 96:4.24

DUCTS. *See also* CHASES

Clothes dryer heat ignites lint in exhaust duct, 93:3.36
Combustible ducts in vapor removal system spread fire, 98:6.84
Deep fat fryer fire ignites grease in, 94:3.28
Electrical connection grounded through, 95:5.35
Fire spread through, 92:4.68, 93:6.82, 94:5.104, 97:6.57, 98:6.87, 90
Grill fire ignites grease in, 96:5.25
Short circuit ignites dust on top of duct, 98:6.84
Sparks sent through, ignite studs in dust collection bin, 98:1.24

DUMPSTER FIRES

Hawaii, 1989, 91:1.31
Michigan, 1996, 97:5.24
New York, 1995, 96:5.26

DUNGAN, KENNETH W.

Profile of, 92:5.20

DÜSSELDORF, GERMANY

Fatal airport terminal fire, Apr. 11, 1996, 96:4.43

DUST

Conveyor belt heat ignites dust, 98:6.91
Exhaust fan malfunction, ignited by, 96:5.23
Furniture manufacturing plant explosion/fire, factor in, 95:6.103
Grain, ignited by smoldering grain, 92:4.28
Hosiery manufacturing plant fire, factor in, 97:3.33
Overheated bearing box, ignited by, 93:6.83
Paper, factor in fire spread, 93:6.84
Paper, ignited by heat from gas heater, 91:6.75
Polyurethane dust ignites, fire spreads through dust collection system, 98:6.87
Sawdust, fire spreads to combustibles from, 94:4.30
Sawdust ignites, explodes, contributes to fire spread, manufacturing plant fire, 97:6.49
Sawdust in attic ignited by spreading fire, 98:6.86
Sugar dust ignited by spark or heat, refinery fire, 97:6.49
Synthetic fabric dust ignited by short circuit, knitting mill fire, 98:6.84

DUST COLLECTION SYSTEMS

Polyurethane dust ignites, fire spreads through dust collection system, 98:6.87
Sparks sent through ducts, ignite studs in dust collection bin, 98:1.24

DWELLING FIRES. *See also* MANUFACTURED HOME FIRES

Alabama, 1995, 96:3.39
Arizona, 1993, 94:6.34
Arkansas, 1997, 98:1.23, 4.19, 6.23
California, 1997, 98:5.16
California, 1991, 92:4.26, 92:6.28
California, 1992, 93:4.25
California, April, 1992, 93:6.79
California, Sept., 1992, 93:6.81
California, 1994, 95:2.30
California, 1995, 96:1.23, 96:2.23, 96:3.36, 96:6.22
Connecticut, 1991, 92:4.26
Florida, 1992, 93:2.21, 93:5.35
Florida, 1993, 94:4.32
Florida, May 4, 1997, 98:6.90

NFPA Journal
10 Year Index 1987-1997

Florida, Oct. 22, 1997, 98:6.90
Georgia, 1991, 92:2.29
Georgia, 1996, 97:2.22
Idaho, 1995, 96:4.22
Illinois, 1994, 95:6.36
Illinois, 1997, 98:1.23, 3.38
Indiana, 1993, 94:1.30
Iowa, 1991, 92:1.22, 92:4.26
Iowa, 1992, 93:3.35
Kentucky, 1990, 91:5.26
Kentucky, 1997, 98:4.19
Maryland, 1993, 94:1.31
Maryland, 1994, 95:3.38
Maryland, 1997, 98:5.16
Massachusetts, 1989, 91:1.27
Massachusetts, 1991, 92:1.21
Massachusetts, 1992, 93:1.27, 93:5.36
Massachusetts, 1993, 94:6.34
Massachusetts, 1995, 96:4.21, 96:6.22
Massachusetts, 1996, 97:1.25, 4.19
Massachusetts, 1997, 98:5.15
Michigan, 1996, 97:1.25
Michigan, 1991, 92:6.28
Michigan, 1993, 94:6.33
Michigan, Feb. 17, 1993, 93:3.57
Michigan, 1995, 96:3.39
Michigan, Jan. 6, 1996, 97:6.58
Michigan, Nov. 14, 1996, 97:6.58
Minnesota, 1991, 92:2.28
Mississippi, 1994, 95:4.38
Missouri, 1991, 92:3.34
Missouri, 1992, 93:4.25
Missouri, 1994, 95:5.34
New Jersey, 1994, 95:6.37
New York, 1991, 92:5.25
New York, 1992, 93:2.22
New York, 1993, 94:1.31
New York, 1994, 95:4.37
North Carolina, 1994, 95:1.34
Ohio, 1992, 93:2.22, 93:5.36, 93:6.28
Ohio, 1993, 94:1.31, 94:5.28
Ohio, 1996, 97:5.21, 6.19
Oklahoma, 1991, 92:6.28
Oklahoma, 1996, 97:3.29
Oklahoma, 1997, 98:3.38
Pennsylvania, 1994, 95:1.34
Pennsylvania, 1997, 98:1.22, 23
Pennsylvania, 1998, 98:3.38
Pennsylvania, multiple dwellings, 1996, 97:4.19
Products first ignited in, 1983-1987, 91:5.72
Rhode Island, 1995, 96:6.22
Texas, 1994, 95:2.29
Texas, 1995, 96:5.25
Texas, 1997, 98:5.17

NFPA Journal
10 Year Index 1987-1997

Texas, March 20, 1997, 98:6.90
Texas, multiple dwellings, 1995, 96:4.21
Utah, 1997, 98:6.23
Washington, 1994, 95:6.36
Wyoming, 1991, 92:5.26

DWELLING FIRES, CATASTROPHIC

Alabama, Aug. 27, 1990, 91:4.64
Alabama, Nov. 12, 1996, 97:5.51
Alabama, July 20, 1997, 98:5.50
Arizona, March 26, 1995, 96:5.92
Arizona, Nov. 5, 1993, 94:5.97
California, Aug. 3, 1992, 93:5.64
California, Nov. 29, 1994, 95:5.62
California, May 29, 1995, 96:5.91
California, Dec. 14, 1995, 96:5.92
California, Dec. 19, 1996, 97:5.51
California, April 26, 1997, 98:5.45
California, June 1, 1997, 98:5.49
Connecticut, Feb. 16, 1991, 92:4.67
Delaware, April 10, 1990, 91:4.66
Delaware, Jan. 20, 1993, 94:5.97
Florida, Jan. 13, 1990, 91:4.64
Florida, Feb. 25, 1990, 91:4.66
Florida, Oct. 15, 1990, 91:4.64
Florida, March 13, 1993, 94:5.98
Georgia, Jan. 26, 1993, 94:5.97
Georgia, Feb. 3, 1993, 94:5.96
Georgia, June 27, 1993, 94:5.98
Georgia, Feb. 4, 1995, 96:5.92
Georgia, Jan. 23, 1997, 97:5.50
Hawaii, Oct. 15, 1997, 98:5.45
Illinois, Jan. 11, 1990, 91:4.65
Illinois, Jan. 1, 1991, 92:4.68
Illinois, Aug. 14, 1994, 95:5.54
Illinois, Jan. 14, 1995, 96:5.91
Illinois, Aug. 12, 1995, 96:5.93
Indiana, June 30, 1994, 95:5.60
Indiana, Aug. 9, 1994, 95:5.56
Indiana, Dec. 4, 1995, 96:5.93
Iowa, March 24, 1994, 95:5.54
Iowa, Dec. 9, 1995, 96:5.93
Kentucky, Sept. 30, 1994, 95:5.60
Kentucky, Nov. 9, 1996, 97:5.51
Louisiana, Nov. 16, 1991, 92:4.68
Louisiana, Oct. 9, 1997, 98:5.50
Maryland, July 7, 1992, 93:5.62
Maryland, April 23, 1993, 94:5.98
Maryland, Jan. 9, 1994, 95:5.54
Maryland, Feb. 26, 1994, 95:5.53
Maryland, Jan. 30, 1996, 97:5.50
Maryland, March 3, 1997, 98:5.45
Massachusetts, May 27, 1990, 91:4.65
Massachusetts, Dec. 24, 1994, 95:5.54
Michigan, Feb. 28, 1990, 91:4.64

NFPA Journal
10 Year Index 1987-1997

Michigan, Dec. 22, 1990, 91:4.64
Michigan, Oct. 3, 1992, 93:5.62
Michigan, Dec. 3, 1992, 93:5.64
Michigan, Feb. 17, 1993, 94:5.96
Michigan, Nov. 30, 1993, 94:5.102
Michigan, July 13, 1994, 95:5.56
Mississippi, April 3, 1994, 95:5.59
Mississippi, Feb. 3, 1996, 97:5.49
Mississippi, March 13, 1996, 97:5.50
Missouri, Aug. 19, 1992, 93:5.64
Missouri, Dec. 5, 1997, 98:5.45
Montana, Sept. 7, 1991, 92:4.68
Montana, Sept. 24, 1994, 95:5.60
New Jersey, June 11, 1991, 92:4.69
New Jersey, June 16, 1991, 92:4.69
New Jersey, Feb. 13, 1992, 93:5.62
New Jersey, Dec. 28, 1994, 95:5.53
New Jersey, Jan. 22, 1995, 96:5.92
New Jersey, July 22, 1995, 96:5.92
New York, Dec. 27, 1990, 91:4.65
New York, Feb. 8, 1991, 92:4.68
New York, April 10, 1991, 92:4.67
New York, April 21, 1991, 92:4.69
New York, Nov. 22, 1991, 92:4.68
New York, Dec. 22, 1991, 92:4.68
New York, June 7, 1993, 94:5.98
New York, Aug. 28, 1993, 94:5.100
New York, Dec. 21, 1993, 94:5.102
New York, Jan. 28, 1994, 95:5.58
New York, Feb. 10, 1994, 95:5.54
New York, June 28, 1994, 95:5.60
New York, Dec. 4, 1994, 95:5.62
New York, June 23, 1995, 96:5.92
New York, Dec. 18, 1995, 96:5.93
North Carolina, Nov. 13, 1992, 93:5.64
North Carolina, Feb. 28, 1994, 95:5.58
North Carolina, Feb. 23, 1996, 97:5.49
North Carolina, Feb. 17, 1997, 98:5.49
North Dakota, Oct. 7, 1994, 95:5.53
Ohio, Oct. 21, 1990, 91:4.66
Ohio, Dec. 25, 1990, 91:4.66
Ohio, Dec. 15, 1991, 92:4.69
Ohio, Jan. 26, 1992, 93:5.62
Ohio, Feb. 14, 1993, 94:5.98
Ohio, Dec. 22, 1993, 94:5.96
Ohio, Jan. 26, 1994, 95:5.56
Ohio, Dec. 28, 1995, 96:5.91
Oklahoma, Feb. 1, 1991, 92:4.68
Oklahoma, Aug. 31, 1991, 92:4.69
Oklahoma, Sept. 21, 1993, 94:5.100
Oklahoma, Nov. 20, 1994, 95:5.62
Pennsylvania, March 3, 1990, 91:4.64
Pennsylvania, July 30, 1990, 91:4.66
Pennsylvania, Feb. 14, 1991, 92:4.67

NFPA Journal
10 Year Index 1987-1997

Pennsylvania, Dec. 14, 1991, 92:4.69
Pennsylvania, March 13, 1992, 93:5.62
Pennsylvania, July 24, 1992, 93:5.62
Pennsylvania, Oct. 2, 1992, 93:5.64
Pennsylvania, Dec. 5, 1992, 93:5.62
Pennsylvania, July 25, 1993, 94:5.97
Pennsylvania, April 6, 1994, 95:5.59
Pennsylvania, Oct. 21, 1994, 95:5.60
Pennsylvania, Dec. 23, 1994, 95:5.58
Pennsylvania, Feb. 12, 1995, 96:5.92
Pennsylvania, May 24, 1997, 98:5.49
Pennsylvania, May 25, 1997, 98:5.46
Pennsylvania, Oct. 24, 1997, 98:5.50
South Carolina, Nov. 7, 1992, 93:5.64
South Carolina, May 23, 1993, 94:5.96
South Carolina, Nov. 13, 1993, 94:5.102
South Dakota, May 8, 1990, 91:4.66
Tennessee, March 9, 1991, 92:4.67
Tennessee, March 31, 1992, 93:5.62
Tennessee, Apr. 13, 1996, 97:5.49
Texas, Oct. 7, 1991, 92:4.68
Texas, Feb. 2, 1995, 96:5.92
Texas, July 22, 1995, 96:5.92
Texas, Oct. 21, 1995, 96:5.93
Utah, Nov. 18, 1992, 93:5.64
Virginia, Sept. 10, 1995, 96:5.99
Virginia, Jan. 20, 1996, 97:5.50
Virginia, May 15, 1996, 97:5.50
Virginia, July 8, 1996, 97:5.51
Virginia, Nov. 19, 1997, 98:5.46
Washington, Dec. 17, 1992, 93:5.66
Washington, Apr. 7, 1995, 96:5.91
Washington, May 31, 1996, 97:5.49
Washington, D. C., Jan. 7, 1993, 94:5.97
West Virginia, March 7, 1993, 94:5.96
West Virginia, Nov. 21, 1997, 98:5.50
Wisconsin, March 13, 1990, 91:4.66
Wisconsin, May 10, 1990, 91:4.65
Wisconsin, Oct. 4, 1990, 91:4.66
Wisconsin, April 22, 1991, 92:4.68
Wisconsin, Feb. 28, 1996, 97:5.49
Wisconsin, March 10, 1996, 97:5.50

DWELLING, VACANT, FIRES. *See* VACANT BUILDING FIRES
DWELLING-UNDER-CONSTRUCTION FIRES

California, 1993, 94:3.27
Catastrophic, New Hampshire, Feb. 26, 1990, 91:4.68
Illinois, 1990, 91:3.27
Massachusetts, 1994, 95:1.34
Pennsylvania, 1995, 96:6.23

E

EARTHQUAKES AND SUBSEQUENT FIRES

Earthquake kits for home and car, 95:3.55
How to react to quake, 95:3.64
Japan, July 12, 1993, 94:3.89

NFPA Journal
10 Year Index 1987-1997

Methodology to deter and mitigate risk of earthquake-caused fires, 94:3.82
Northridge, Calif., Jan. 17, 1994, 95:3.52
San Francisco, Calif., Oct. 17, 1989, 94:3.88

EDITORIALS

Agreement for single model fire code is blueprint for progress, 97:3.10
Back to fire safety basics, 93:5.4
Call for consensus on NFPA standards, 93:2.4
Cast a vote for fire safety, 92:6.4
Children's sleepwear regulations threatened by proposed amendments, 95:5.6
Connections, 92:5.4
Constructive criticism from members keeps NFPA on toes, 98:2.6
CPSC amendment of children's sleepwear standard opposed, 96:4.6
Dedication to fire safety can save lives, 97:1.8
Defining NFPA's mission for year 2000, 94:5.4
Federal government as partner in code/standard development, 96:6.6
Fire fighter fatalities, prevention of, 91:4.4
Fire protection's future, 92:1.4
Fire safe design for high-rise buildings, 93:6.4
Fire safety: tough challenges, great rewards, 94:1.4
Fire safety implications of home security systems, 94:3.4
Fire safety knowledge is power, 95:1.6
High technology's value for fire protection, 92:2.4
Home Fire Sprinkler Coalition supports residential sprinklers, 97:2.8
Homeowner responsibility for wildfire protection efforts, 94:2.4
HUD turns to NFPA to update manufactured housing safety standards, 98:6.6
Imagining more fire safety achievements, 96:3.6
National Electrical Code celebrates 100th anniversary, 95:3.6
National Fire-Incident Reporting System provides important data, 95:2.6
National model building code, 96:1.6
New Latin American Section part of NFPA's international outreach, 97:5.8
NFPA, International Code Council (ICC) end agreement to develop one U. S. fire code, 98:3.8
NFPA, leading the way on codes and standards, 91:6.4
NFPA, the old and the new, 91:2.5
NFPA commitment to Learn Not to Burn programs, 93:4.4
NFPA develops long-range plan, 93:3.4
NFPA faces stiff competition on international acceptance of codes, standards, 97:4.8
NFPA joins fight against smoking, 94:4.4
NFPA must balance tradition, transition, 94:6.4
NFPA responds to demands of global community, 95:4.6
NFPA service to members, 91:1.5
NFPA's new president, George D. Miller, 92:3.4
NFPA's second century of service, 96:2.6
NFPA's sense of mission, 91:5.4
A plumber's nightmare, 92:4.4
Protecting NFPA copyrights and trademarks protects the NFPA's mission, 98:4.6
Renewing our commitment to fire safety, 93:1.4
Risk Watch, critical to child safety, deserves support, 98:5.6
Risk Watch program addresses child safety issues, 98:1.8
Sparky campaign and community fire safety, 96:5.6
Using new ideas for fire safety, 91:3.5
Values of publicity, perseverance in spreading NFPA message, 97:6.8

**EDUCATIONAL OCCUPANCY FIRES. See also COLLEGE BUILDING FIRES;
SCHOOL FIRES**

NFPA Journal
10 Year Index 1987-1997

- Fraternity house, Pennsylvania, 1992, 93:1.27
- University bell tower, West Virginia, 1993, 94:4.30
- University building, Kansas, June, 1991, 92:6.78
- EGRESS. *See also* DOORS; EXITS
 - Blocked by furniture, stored goods in catastrophic fire, 95:5.53
 - Building performance to foster correct occupant egress behavior, 93:3.62
 - Building site plan needs exit discharge from exit to public way, 98:5.22
 - Catastrophic fire victims took wrong turn in escape attempt, 98:5.49
 - Elevators as means of egress, 96:1.30
 - Evaluating occupant load for egress, 94:1.14
 - Exit access, exterior exits, and exit discharge must be clear of obstructions, 98:6.28
 - Inadequate, factor in fatal fire, 92:6.77, 93:1.29, 93:2.44
 - Limited from second floor, factor in large-loss-of-life club fire, 91:4.67
 - Occupational Safety and Health Administration (OSHA) and Life Safety Code egress standards compared, 93:5.45
- ELDERLY
 - Fire deaths of elderly
 - Board and care facility fire, 97:1.27
 - Careless use of cigar as cause, 98:5.15
 - Careless use of cigarette as cause, 98:1.23
 - Causes and prevention, 91:2.36
 - Clothing fire, elderly death resulting from, 98:2.16, 3.38
 - Clothing fires, elderly deaths resulting from, 96:3.39, 97:1.25
 - Risk of fatalities higher for elderly, 97:1.44
 - Fire department and elderly agencies focus on seniors' fire safety, 94:3.13
 - Fire risk to elderly, statistics, 96:2.104
- ELDERLY HOUSING FIRES. *See* HOUSING FOR ELDERLY FIRES
- ELECTRIC GENERATING PLANT FIRES. *See also* NUCLEAR ENERGY PLANT FIRES
 - Alabama, Nov., 1991, 92:6.76
 - Alabama, June, 1993, 94:6.92
 - Arkansas, Aug., 1993, 94:6.92
 - California, Jan. 10, 1990, 91:6.76
 - California, Oct., 1993, 94:6.92
 - Catastrophic
 - Indiana, Oct. 5, 1992, 93:5.67
 - Kansas, Nov. 24, 1997, 98:5.54
 - New Jersey, Dec. 25, 1992, 93:5.67
 - Florida, July, 1992, 93:6.82
 - Florida, Aug., 1995, 96:6.72
 - Florida, June 30, 1997, 98:6.91
 - Georgia, June, 1993, 94:6.92
 - Illinois, April, 1994, 95:6.102
 - Illinois, Nov., 1994, 95:6.100
 - Illinois, Dec. 18, 1996, 97:6.58
 - Michigan, Apr. 26, 1996, 97:6.59
 - Missouri, June, 1993, 94:6.92
 - New Jersey, Dec. 25, 1992, 93:2.44, 93:6.82
 - New York, May, 1992, 93:6.82
 - New York, March, 1993, 94:6.91
 - South Carolina, Dec., 1994, 95:6.100
- ELECTRIC MOTORS
 - Motor and motor-controller disconnect requirements, 95:4.42

NFPA Journal
10 Year Index 1987-1997

ELECTRICAL EQUIPMENT FIRES. *See also* HEATING-AND-COOKING EQUIPMENT FIRES

- Air conditioner malfunction causes fatal fire, 98:4.20
- Air-compressor ignites lubricating oil, 92:6.79
- Arc welding sparks ignite stored carpet pads, 93:1.26
- Audio equipment malfunctions, ignites housing, 96:5.93
- Bearing box overheats on conveyor belt, ignites chaff and dust, 93:6.83
- Boat electrical system ignites gasoline, 91:4.31
- Book binding machine overheats, ignites glue, 93:4.27
- Christmas tree lights
 - Bulb blows, ignites tree, 94:6.34
 - Improperly spliced, ignites tree, 94:6.90
 - Short, ignites tree, 95:6.36
- Clothes dryer
 - Heat ignites lint in exhaust duct, 93:3.36
 - Ignites nursing home fire, 96:2.25
- Clothes iron, unattended, ignites wooden table, other combustibles, 96:5.26
- Coffeemaker
 - Cord shorts, ignites wall covering, 97:2.22
 - Defective, ignites stored materials, 97:4.21
- Coffeepot ignites paper products, 92:2.25
- Compressor malfunctions, overheats, ignites wood construction, 97:3.29
- Cooler/freezer controls malfunction, ignites restaurant fire, 96:3.35
- Cord
 - Damaged, ignites carpet, 94:5.28
 - Improperly modified, overheats, causes short circuit, 95:5.60
 - Improperly spliced to air conditioner overheats, ignites combustibles, 98:3.41
 - Overheats, ignites carpet, 92:3.32
 - Overloaded, shorts, ignites sofa, 97:3.29
- Corn popper ignites wood paneling, 94:5.95
- Curling iron, left on, ignites counter, carpet, 94:5.27
- Dimmer switch, overloaded, ignites wall insulation, 94:2.30
- Drop light
 - Incandescent bulb ignites leaked fuel, 97:6.23
 - Trash ignited by, 91:2.31
- Drying machine overheats, ignites pet food, 94:3.29
- Electrical component in sauna unit short-circuits, ignites wood partitions, 93:6.79
- Elevator transformer overheats, ignites oil, 96:5.26
- Emergency light ignites stored clothing, 92:2.27
- Extension cord
 - Damaged by forklift traffic, ignites spilled glue, 98:4.20
 - Defective, ignites Christmas tree, 92:6.28
 - Electrical fault ignites stored combustibles, paneling, 97:5.50
 - Failed, ignites carpeting, 95:6.37
 - Failed, ignites combustibles, 96:5.92
 - Joined to heater cord, overheats, ignites living room contents, 94:5.96
 - Overheats, ignites plastic garland, 94:6.35
 - Overheats, ignites cardboard combustibles, 97:4.22
 - Used for space heater, creates high-resistance fault, ignites combustibles, 98:5.46
- Extension cord, overloaded
 - Carpeting ignited by, 92:4.67
 - Christmas tree ignited by, 93:5.64, 94:6.33
 - Clothing, toys ignited by, 97:5.51
 - Combustibles ignited by, 96:5.93, 98:4.19

NFPA Journal
10 Year Index 1987-1997

- Curtains ignited by, 96:5.92
- Door frame ignited by, 91:4.65
- Fabric ignited by, 91:4.26
- Fire ignited by, 92:4.69
- Possible fire cause, 98:5.18
- Shorts or arcs, ignites combustibles, 97:5.51
- Exterior lights
 - Combustible exterior sidewall ignited by, 93:1.25
 - Fixture used inside ignites carpet, flooring, 97:6.22
- Fan
 - Improperly wired, causes grounding through ducts, ignites wood, 95:5.35
 - Malfunctions, ignites dry wood, 95:6.99
 - Malfunctions, ignites dust, 96:5.23
 - Motor overheats, ignites plastic trim, 95:5.33
 - Short circuit ignites grease, 95:6.106
 - Short circuit ignites wood framing, 91:6.25
- Floodlights
 - Cold air balloon ignited by, 94:6.35
 - Paint tarpaulins ignited by, 94:4.30
- Fluorescent light ballast
 - Foam insulation ignited by, 92:1.26
 - Overheats, ignites ceiling tiles, 96:5.25
 - Overheats, ignites fabric lint, 97:3.33
 - Overheats, ignites structural members, 93:2.22
 - Wood framing ignited by, 95:2.32
- Generator ignites cardboard, 91:2.30
- Glue gun ignites fireworks factory fire, 91:4.30
- Gondola motor overheats, ignites carbon brushes, 94:3.28
- Heat tape
 - Malfunctions, ignites PVC piping, 93:1.28
 - Structural members ignited by, 91:5.28
 - Wood eaves ignited by, 92:1.23
- Heating blanket short-circuits, ignites, 94:3.30
- Heating element ignites dip tank, 94:6.36
- Hot tub malfunctions, ignites spa, wall, curtains, 96:3.36
- Lamp
 - Cloth ignited by, 91:4.25, 26
 - Clothing draped on lamp ignited, 94:6.33
 - Halide, explodes, ignites cardboard, 98:6.87
 - Halogen, ignites curtains, 98:1.23
 - Heat, ignites wood lining of boat engine room, 91:6.26
 - Knocked over, ignites carpet in fatal fire, 98:2.16
- Light bulb
 - Explodes, ignites combustibles, 91:5.25
 - Mop ignited by, 93:2.20
- Light fixtures
 - Arc ignites fire, 95:5.54
 - Mercury vapor fixture ignites stored mattresses, 95:4.39
 - Stored combustibles ignited by, 96:6.68
 - Stored foam products ignited by, 98:1.25
 - Stored paper ignited by, 94:6.94
- Lights, decorative, ignite Christmas tree, 91:6.24
- Mixer cord pulled from receptacle, arcs, ignites lint, 97:3.33
- Motor malfunctions, overheats, ignites leaked oil, 97:3.33

NFPA Journal
10 Year Index 1987-1997

Outlet

- Arcs, ignites bed, 98:5.45
- Overheated, ignites manufacturing plant fire, 97:6.52
- Packaging machine malfunctions, ignites combustible materials, 93:6.29
- Portable light ignites flammable liquid, 91:2.30
- Power transfer equipment fire, electric generating plant, 97:6.59
- Production equipment malfunctions, ignites combustibles, 95:6.107
- Pump arcs, ignites fuel, 94:5.106, 94:6.98
- Quartz lighting ignites oil, 94:6.94
- Radio cord
 - Cabinet ignited by, 92:6.29
 - Short-circuits, ignites rugs, curtains, newspapers, 94:1.31
- Refrigerator ignites wood paneling, counter top, 92:6.31
- Soldering gun ignites oil on cord, 93:5.37
- Spotlight ignites wood shingles, 97:1.27
- Surge protector malfunctions, ignites combustibles, wood paneling, 98:5.45
- Surgical cauterizing pen ignites sterile drapes, 98:5.17
- Toaster, fire started in, 98:6.90
- Unspecified equipment failure produced heat, ignites combustibles in basement, 98:5.49
- UPS systems, fighting fires in, 94:5.33
- Vacuum cleaner ignites gasoline vapors, 92:5.28
- Waffle iron ignites workbench, 91:3.25
- Wall receptacle malfunctions, ignites bed and bedding, 94:2.28
- Waste-handling machine overheats, ignites fiber residue, 92:5.30

ELECTRICAL FIRES

- Bus bar malfunctions, ignites hotel fire, 94:2.29
- Capacitor discharges, spark ignites varnish in dip tank, 97:6.52
- Circuit overload ignites school fire, 98:1.21
- Conduit
 - Penetrated by screw, ignites fire, 95:6.99
 - In wall void ignites wood siding, 94:5.28
- Distribution line arcs, ignites grass fire, 97:6.59
- Electric panel
 - Arcs, ignites wood cage, combustibles, 97:6.22
 - Damaged by roof collapse, arcs, ignites combustibles, 97:1.28
- Electrical arc
 - Caused by water in electrical system, ignites ceiling tiles, 97:6.49
 - Conduit/busway contact ignites stored combustibles, 98:6.24
 - Flammable gas ignited by, 92:6.28
 - Ground fault created by switch, 98:5.54
 - Hydrogen ignited by, 95:6.102
- Electrical failure causes fire, 93:1.26
- Electrical service circuit protection fails, arcing ignites cable insulation, 92:6.78
- Electrical system failure ignites ceiling, 94:6.95
- Fault in control cable causes generating plant fire, 95:6.100
- Fault in transformer vault ignites generating station, 94:6.91
- Forklift control arcs, ignites pentane, 91:6.26
- Friction sparks ignite nylon fluff and oil, 93:6.82
- Ground, absence of, key element in fire, 95:5.35
- Ground fault arc and explosion ignites fire, 92:6.78
- Heat trace cable ignites wood framing, 96:6.24
- High-voltage box malfunctions, burns plastic insulation, 96:3.40
- High-voltage power line arc ignites bus, 92:4.26
- Junction box fault ignites wood paneling, 97:5.50

NFPA Journal
10 Year Index 1987-1997

On/off switch malfunctions, probable fire cause, 91:1.30
Power line, downed, arcs, electrocutes fire fighter, 97:4.57
Power supply to machinery malfunctions, ignites rolled paper, 96:6.62
Receptacle arcs, ignites bedding, 97:5.52
Receptacle wiring overheats, wire insulation fails, 98:3.38
Service cable, damaged, ignites structural members, 96:5.93
Short circuit
 In appliance ignites fabric, 98:6.92
 Arc ignites mine fire, 92:6.77
 Arcing from power lines, ignites dry vegetation, 91:6.74
 Automobile fire possibly ignited by, 95:2.31
 Barn fire ignited by, 96:2.25
 In battery ignites subway car, 91:4.31
 In battery ignites truck, shed, 92:6.26
 Burns hole in conduit, ignites rafters, 94:4.31
 created by switch, 98:5.54
 In dryer motor ignites sawdust, 93:6.83
 In electric raceway ignites counter, 93:1.26
 In electrical cord ignites sofa, 97:3.29
 In extension cord ignites Christmas tree, 92:6.28
 In extension cord ignites van fire, 93:1.28
 In fan ignites grease, 95:6.106
 In fan ignites wood framing, 91:6.25
 In fixed wiring ignites structural members, ceiling, floor, 93:1.27
 In freezer cord ignites stored paper products, 98:6.21
 In junction box ignites stored goods, 93:4.26
 In lamp cord ignites sofa, 93:6.28
 Light ballast material ignited by, 91:3.29
 In lighting, sound equipment ignites fire, 92:6.25
 In lights ignites Christmas tree, 93:6.28
 In line ignites underground electrical vault, 91:4.69
 In low-voltage wiring ignites beams, 96:1.24
 In neon sign ignites mixed-use building, 93:6.81
 Plywood wall ignited by, 95:6.107
 School fire ignited by, 98:1.21
 In sign wiring ignites hotel facade, 98:5.16
 Structural framing ignited by, 97:5.49
 In typewriter ignites plastic housing, 91:5.25
 Wall covering ignited by, 98:6.92
 In wall receptacle ignites wall paneling, 93:5.62
 In wiring ignites artificial Christmas tree, 93:6.28
 In wiring ignites paneling, 92:2.28
 In wiring ignites synthetic fabric dust, 98:6.84
 Wood framing ignited by, 93:6.30
Sparks, caused by (*See* SPARKS)
Static electricity ignites paint, 93:5.38
Temporary electrical system malfunctions, ignites fire, 98:6.24
Transformer arcs, ignites oil, 94:6.92
Underground feed lines penetrated by augur, cause short circuit, 95:6.100
Uninterrupted power supply unit ignites fire, 95:2.30
Wiring
 Arcs as power is restored after fire, ignites second fire, 97:6.54
 Cloth-covered, malfunctions, ignites wood framing, 95:5.62
 Connections corrode, arc, ignite framing, 97:3.30

NFPA Journal
10 Year Index 1987-1997

Defective, ignites fire, 93:2.22
Fault in, ignites framing, 97:5.23
Fault in, ignites wall paneling, 96:5.93
Fire ignited by, 95:4.40
Grounds out on conduit, ignites soffit, 98:6.86
Inadequately sized, ignites wall, 91:4.67
Installed incorrectly, heat nails, ignite joist, 98:5.15
Installed incorrectly, ignites insulation, 94:4.32
Installed incorrectly, ignites kitchen fire, 98:5.46
Insulation ignited by, 94:4.29
Joist ignited by, 92:3.34
Malfunction in concealed space ignites fire, 95:5.56
Malfunctioning, ignites fire, 92:4.67
Overheats, ignites structural wood, 96:2.24
Overheats in concealed space, ignites structural framing, 98:2.19
Overloaded, factor in catastrophic fire, 97:5.51
Overloaded, ignites wood framing, 95:5.56
Overloaded or damaged, ignites wood framing, 93:5.64
Short-circuits, ignites insulation, 94:3.27
Short-circuits, ignites wood framing, 92:4.68
Transformer connection, incorrect, heats housing, ignites cardboard, 98:4.22
From utility pole ignites vehicle after accident, 96:5.100
Wrapped on nail ignites joist, 91:3.27

ELECTRICAL INSPECTIONS

Budget cutback threaten inspections, 96:6.80

ELECTRICAL SAFETY

Experts answer questions on *National Electrical Code*, 96:1.28

ELECTRICAL SAFETY COLUMNS

Alarm systems ensure safe elevator recall, 93:3.28
Boat repair safety requirements for wiring, equipment, 95:5.40
Electrical standards go global, 94:1.34
Ensuring electrical safety in workplaces, 94:4.35
Excessive fault current prevention, 92:2.80
Fighting fires in UPS systems, 94:5.33
Fire investigation safety precautions, 92:3.38
Grounding equipment to protect people and equipment, 94:3.36
Grounding of electrical systems, historical arguments for/against, 94:2.32
Harmonics and power quality, 93:4.30
Holiday lighting hazards, 95:6.42
Main service disconnect, *National Electrical Code* terms and requirements, 91:6.88
Motor and motor-controller disconnect requirements, 95:4.42
National Electrical Code, and the global marketplace, 91:3.120
National Electrical Code prevents hot tub, spa accidents, 92:4.22
National Electrical Code work space requirements for energized electrical equipment, 95:1.37
NFPA 72, *Protective Signaling Systems*, combines previous standards, 91:5.86
NFPA 72, UL alarm standards work together, 93:5.24
Polychlorinated biphenyls (PCBs), 91:1.116
Portable tool safety, 94:6.38
Residential electrical system reinspection, 91:2.112
Resistance-type heat tape installation to prevent frozen water pipes, 95:3.45
Service-entrance conductors protect against overloads, 92:1.72
Sprinklers installed over energized electrical and electronic equipment, 93:6.31
Staying safe around high-voltage equipment, 95:2.34

NFPA Journal
10 Year Index 1987-1997

- Who interprets the NEC?, 92:5.12
- Workplace safety procedures are important, 93:2.28
- ELECTROCUTION**
- Fire fighter fatalities related to, 94:4.65, 96:4.72, 97:4.57, 58, 98:4.61
- ELECTRONIC EQUIPMENT. See COMPUTERS AND RELATED EQUIPMENT**
- ELECTRONICS INDUSTRY**
- Fire protection for, 92:2.32
- ELEVATOR MECHANICAL ROOMS**
- Motor malfunctions, ignites leaked oil, 97:3.33
- ELEVATORS**
- Alarm systems ensure safe recall, 93:3.28
- Bulk storage (grain), catastrophic fire, Indiana, Oct. 1, 1996, 97:5.52
- Bulk storage (grain), fire, Alberta, Canada, 1996, 97:4.20
- Elevator recall and shut down requirements increase safety, 97:5.64
- Fire spread through shafts, 94:5.104
- Means of egress, use as, 96:1.30
- Safe use as vertical exits, overview, 93:3.49
- Transformer overheats, ignites hospital fire, 96:5.26
- Workers trapped in stalled elevator in catastrophic fire, 97:5.52
- EMERGENCY COMMUNICATIONS. See also FIRE SERVICE COMMUNICATIONS**
- Ham radio operators' role, 96:2.46
- EMERGENCY MANAGEMENT**
- Basics of mitigation, preparation, response, and recovery, 95:4.44
- Oklahoma City bombing, April 19, 1995, 95:4.51
- EMERGENCY MEDICAL SERVICE**
- Fairfax County, Va., Fire and Rescue Department response to CIA shooting incident, 94:1.77
- Fire fighter injuries related to, 96:6.108
- Fire service public service programs, 95:1.70
- User fees implemented to recover cost of services, 97:2.66
- EMERGENCY PLANNING**
- Drill, Logan International Airport, Boston, Mass, 91:2.54
- Drill, plane crash simulation at Hancock Tower high-rise, Boston, 93:6.35
- Federal program trains first responders for terrorist attacks, 98:6.31
- Hospital's plan effective in actual emergency, 97:3.88
- Prefire planning, inspections aids in actual fire attack, 98:1.21
- Six-part process for emergency planning, 93:1.22
- Terrorist attacks, preparation for, 96:1.54, 96:2.35
- Terrorist response training funded by Domestic Preparedness Act, 98:1.38
- EMERGENCY RESPONSE**
- Fire service response to Florida tornadoes, Feb. 22, 1998, 98:3.60
- EMERGENCY RESPONSE SYSTEMS**
- Analysis and enhancement of system, Vancouver, Wash., 91:1.78
- E911 fails in telephone exchange fire, 95:5.109
- How to upgrade existing systems, 94:2.62
- Northridge, Calif. earthquake, Jan. 17, 1994, 95:3.52
- ENVIRONMENT**
- Fire and the environment, 91:1.34
- Hazardous materials incident response to mitigate environmental damage, 91:1.112
- NFPA report on foam and environment, 95:3.67
- Run-off controlled in automobile repair shop fire, 97:5.23
- Tire fire pollutes environment, 91:1.50
- ESCAPE. See EGRESS; EXITS**
- EUROPEAN COMMUNITY**

NFPA Journal
10 Year Index 1987-1997

Product testing standards, 92:5.45

EVACUATION

- Adult congregate living facility, successful, 95:6.35
- Aircraft, successful, 92:6.77, 93:6.88
- Apartment building, successful, 96:1.22, 97:5.22
- Auto dealership, area surrounding, due to propane fire, successful, 93:3.36
- Board and care facility, successful, 94:6.33, 96:3.36
- Board and care facility, unsuccessful, 93:5.66, 94:5.104, 95:5.64, 97:5.52
- Bus, electrically charged, successful, 92:4.26
- Chemical manufacturing plant, area surrounding, successful, 95:5.66
- Community center, successful, 97:5.23
- Department store elevator, successful, 97:3.33
- Dormitory, successful, 91:4.25
- Food plant fire, unsuccessful, 92:1.29
- Food store, successful, 93:6.29
- Fraternity house, unsuccessful, 97:6.21
- Hazardous waste incinerator, successful, 95:6.38
- High-rise office building complex (World Trade Center, N. Y.), 94:5.104, 94:6.90, 95:2.59
- Hospital, successful, 93:2.20, 94:5.105, 96:5.26, 97:3.88
- Hotel, successful, 93:6.81
- Housing for elderly, successful, 91:3.25
- Iron foundry, area surrounding, successful, 97:6.50
- Limited-care facility fire, unsuccessful, 98:4.21
- LP-Gas distribution facility, area surrounding, successful, 97:4.20
- Manufacturing plant, area surrounding, successful, 91:4.30, 93:6.27
- Manufacturing plant, successful, 91:2.33
- Medical research laboratory, successful, 91:5.30
- Meeting hall fire, firefighter evacuation, successful, 98:1.21
- Nursing home, successful, 91:5.30, 92:4.27, 92:6.29, 96:2.25, 98:5.17
- Office building, successful, 92:5.28
- Plastics manufacturing plant, area surrounding, due to toxic smoke, successful, 94:6.93
- Railroad collision and fire, area surrounding, 98:6.91
- Restaurant, successful, 96:3.35, 96:5.25
- School, successful, 92:2.25, 92:4.27, 92:6.29, 93:3.33, 94:5.28, 97:2.23
- Store(s), successful, 91:1.29, 97:4.22
- Theater, successful, 96:2.26
- Wildland fires, California, 94:2.85
- Wildland/urban interface fire, 94:5.108

EWELL, P. LAMONT

Profile of, 95:3.30

EXITS. See also DOORS; EGRESS; WINDOWS

Blocked

- By burning chair, factor in fatal fire, 98:2.18
- By burning mattress, factor in fatal fire, 92:5.25
- Catastrophic dwelling fire, factor in, 91:4.66
- Catastrophic food processing plant, factor in, 92:4.70
- By chair, factor in catastrophic fire, 94:5.102
- By fire, factor in catastrophic fire, 94:5.100, 97:5.50, 98:5.45, 5.50
- By fire, factor in fatal fire, 97:1.27, 4.20, 98:3.36
- By furniture, factor in catastrophic fire, 69, 92:4.67, 93:5.62, 95:5.59
- By refrigerator, factor in fatal fire, 98:3.38
- By security bars (*See SECURITY PROVISIONS*)
- By water, crash damage, factor in catastrophic aircraft fire, 93:5.68

NFPA Journal
10 Year Index 1987-1997

- Building site plan needs exit discharge from exit to public way, 98:5.22
- Elevators as safe vertical exits, overview, 93:3.49
- Exit access, exterior exits, and exit discharge must be clear of obstructions, 98:6.28
- Inadequate egress routes, factor in fatal fire, 98:5.16
- Inadequate exit arrangements, factor in catastrophic fire, 94:1.42, 97:5.54
- Lack of second exit, factor in catastrophic fire, 93:5.66
- Locked
 - Catastrophic manufacturing plant fire, factor in, 92:4.70
 - Catastrophic vacant dwelling fire, factor in, 91:4.68
 - Conflict between security and fire safety, 94:3.110
 - Hamper escape in catastrophic dwelling fire, 91:4.64
 - Hamper escape in fatal apartment fire, 91:4.26
 - Hamper fire fighting operations in shopping mall fire, 91:1.29
 - Large loss of life club fire, factor in, 91:4.67
 - Large loss of life manufacturing plant fire, factor in, 94:1.48, 94:3.110
- NFPA "Great Escape" promotes home fire drills and escape plans, 98:3.74, 4.32
- Propped open, 97:4.19
- School exits require balancing fire safety and security needs, 98:3.46
- Secured, factor in catastrophic vacant club fire, 91:4.68
- Single exit from apartment, factor in catastrophic fire, 98:5.49
- EXPLOSION SUPPRESSION SYSTEMS**
 - Disabled, not a factor in explosion, 95:6.103
- EXPLOSIONS. *See also* BLEVE**
 - Fire fighter injuries related to, 96:6.107
 - Paper mill, Florida, April 13, 1994, 95:5.66, 95:6.106
 - Propane, 91:3.27, 97:3.33
 - Steel plant, Ohio, April 20, 1994, 95:5.64
- EXPLOSIONS AND FIRES. *See also* GAS FIRES AND EXPLOSIONS; LP-GAS FIRES AND EXPLOSIONS**
 - Aerosol container explodes, ignites dwelling fire, 92:6.28
 - Aircraft in flight, Texas, Sept. 11, 1991, 92:4.72
 - Ammonium nitrate mixing plant, Minnesota, Nov. 17, 1993, 94:5.105
 - Barge fire, Illinois, July 3, 1997, 98:5.55
 - Barge fire, Louisiana, 1990, 91:4.70
 - Black powder manufacturing plant, Pennsylvania, May 15, 1991, 92:4.71
 - Boat
 - California, Nov. 16, 1991, 92:4.73
 - Massachusetts, 1994, 95:4.39
 - Nebraska, 1990, 91:4.31
 - Ohio, May 9, 1993, 94:5.106
 - Camping trailer, Alabama, Dec. 6, 1997, 98:5.56
 - Chemical fertilizer plant, Iowa, Dec. 13, 1994, 95:5.66
 - Chemical packaging and storage facility, Arkansas, May 8, 1997, 98:5.53
 - Chemical plant
 - Louisiana, May 1, 1991, 92:4.70, 92:6.75
 - Ohio, 1990, 91:3.31
 - Ohio, May 27, 1994, 95:5.66
 - South Carolina, June 17, 1991, 92:4.70, 92:6.80
 - Texas, 1990, 91:4.67
 - Texas, March, 1991, 92:6.75
 - Chemical refinery, Texas, Aug., 1995, 96:6.64
 - Compressed natural gas cylinder ruptures, 94:4.30
 - Crude oil vapors, tank storage facility
 - Louisiana, 1990, 91:4.68

NFPA Journal
10 Year Index 1987-1997

Oklahoma, 1990, 91:4.69
Dwelling, Massachusetts, 1996, 97:6.20
Electric generating plant
 Arkansas, Aug., 1993, 94:6.92
 Illinois, Dec. 18, 1996, 97:6.58
 Illinois, Nov., 1994, 95:6.100
 Kansas, Nov. 24, 1997, 98:5.54
 Missouri, June, 1993, 94:6.92
 New Jersey, Dec. 25, 1992, 93:2.44, 93:5.67, 93:6.82
 S. Carolina, Dec., 1994, 95:6.100
Explosives, coal mine, Kentucky, 1990, 91:4.69
Fireworks display, New Hampshire, 1995, 96:4.24
Fireworks in garage, Ohio, 1989, 91:1.31
Fireworks plant
 Mississippi, 1990, 91:4.30
 New Hampshire, 1992, 93:3.35
 Wisconsin, May 16, 1991, 92:4.71
Gasoline vapor ignited by gas furnace, dwelling, Michigan, 1991, 92:6.28
Grain dust at mill and storage facility, Washington, 1991, 92:4.28
Halide lamp explodes, ignites cardboard, warehouse fire, Iowa, Apr. 22, 1997, 98:6.87
Hazardous waste incinerator, Arkansas, 1994, 95:6.38
Hydrogen storage tower at soap plant, 1989, 91:5.30
Iron foundry, Illinois, May 1, 1996, 97:6.50
LP-Gas bulk storage facility, Texas, April 7, 1992, 93:5.67
Magnesium smelting operation, New Jersey, 1992, 93:3.34
Manufacturing plant, N. Carolina, Oct. 20, 1994, 95:6.103
Metal building components manufacturing plant, Texas, Jan. 31, 1997, 98:6.86
Metal foundry, Indiana, June 22, 1995, 96:5.97
Methanol production plant, Texas, Oct., 1994, 95:6.102
Munitions ship explosion, Halifax, Nova Scotia, Dec. 6, 1917, 92:3.96
Office building, Oklahoma City, April 19, 1995, 95:4.51, 96:1.50, 96:5.94, 96:6.69
Oil and natural gas drilling well, Louisiana, June 16, 1997, 98:5.53, 6.91
Oil refinery
 Ohio, Oct. 12, 1996, 97:6.49
 Pennsylvania, Oct. 16, 1996, 96:5.96
Oil storage tank, Kentucky, July 2, 1993, 94:5.104
Oil well, Ohio, Oct. 10, 1991, 92:4.71
Paint plant, California, 1991, 92:4.28
Paper and pulp products plant, Iowa, Feb., 1995, 96:6.63
Pharmaceutical manufacturing plant, New Jersey, Apr. 21, 1995, 96:5.94
Plywood manufacturing plant, Washington, Sept. 1, 1996, 97:6.49
Propane cylinder BLEVE, 91:6.23
Propane gas, ignited by pilot light, 91:1.28
Propane storage tank, North Dakota, 1993, 94:1.30
Pyrotechnic storage and manufacturing facility, Tennessee, June 5, 1997, 98:5.53
Refinery
 California, Jan. 21, 1997, 98:6.84
 Louisiana, March, 1991, 92:6.77
 Louisiana, Aug., 1993, 94:6.93
 Texas, April, 1991, 92:6.75
Restaurant in high-rise office building fire, New York, 1996, 97:6.22
Rocket propellant test facility, California, 1994, 95:4.40
School, New London, Texas, March 18, 1937, 93:5.94
Ships, Florida, Aug., 1993, 94:6.98

NFPA Journal
10 Year Index 1987-1997

- Short circuit in underground electrical vault, 91:4.69
- Soybean processing plant, Indiana, June, 1994, 95:6.103
- Sports equipment manufacturing plant, Texas, Aug. 28, 1997, 98:6.87
- Steam explosion, petroleum refinery, Louisiana, March 3, 1991, 92:4.70
- Sugar refinery, Nebraska, July 20, 1996, 97:6.49
- Tank farm/storage facility
 - Georgia, April, 1995, 96:6.66
 - Oklahoma, Apr. 23, 1995, 96:5.97
 - Pennsylvania, Oct., 1995, 96:6.62
- Thermal generating plant, New Jersey, Dec. 25, 1992, 93:2.44, 93:5.67, 93:6.82
- Toy manufacturing plant, California, Nov. 15, 1997, 98:5.53
- Warehouse
 - Washington, Sept., 1993, 94:6.97
 - Washington, 1995, 96:4.23
- World Trade Center, New York, Feb. 26, 1993, 93:6.91, 94:5.104, 94:6.90, 95:2.59
- EXPLOSIVES. *See also* FIREWORKS; PYROTECHNICS
 - Accidental detonation, catastrophic fire cause, 91:4.69
 - Bomb site, fire fighter injuries related to, 98:6.54
 - Detonation by terrorists, catastrophic fire cause, 96:5.94
 - Improperly stored, catastrophic fire cause, 92:4.72
 - Juveniles injured making napalm, 97:4.19
- EXPOSURE, FIRE
 - Fire fighter fatalities related to, 94:4.67, 68, 69
 - Fire fighter injuries related to, 94:6.64
- EXPOSURE TO FIRE PRODUCTS. *See* FIRE PRODUCTS
- EXTINGUISHERS, PORTABLE
 - Carbon dioxide, explosion of, 91:4.30
 - Carbon dioxide, successful in hospital fire, 96:5.26
 - Halon, successful in medical research laboratory fire, 91:5.30
 - NFPA 10, *Portable Fire Extinguishers*, common questions answered, 96:4.28
 - Portable multiclass, successful in solvent fire, 93:5.37
 - Spread fire from engine room in boat fire, 91:6.26
 - Successful use of
 - Department store fire, 98:6.22
 - Electric power generating plant fire, 98:5.54
 - Hospital fire, 93:2.20, 96:5.26
 - Nursing home fire, 95:5.33
 - Store fire, 95:3.39
 - Textile plant fire, 93:5.37
 - Warehouse fire, 91:5.25, 95:3.39
 - Training and use of, 97:2.29
 - Unsuccessful use of
 - Adult congregate living facility fire, 95:6.35
 - Building supply store fire, 97:6.54
 - Dairy plant fire, 92:3.32
 - Department store fire, 96:6.72
 - Dormitory fire, 95:6.99
 - Fireworks fire, 93:3.35
 - Food processing plant fire, 95:6.104
 - Fraternity house fire, 97:6.21
 - Funeral home fire, 97:2.21
 - Gasoline fire, 91:4.30
 - Hosiery manufacturing plant, 97:3.33
 - Hotel fire, 97:6.19

NFPA Journal
10 Year Index 1987-1997

- Meat processing plant fire, 95:6.106
- Metal products plant fire, 98:6.84
- Museum fire, 95:6.35
- Observatory fire, 97:6.59
- Paper plant fire, 97:5.24
- Plastics plant fire, 97:1.28
- Restaurant fire, 96:3.35, 97:6.22, 98:3.36
- Store fire, 96:6.69, 98:6.89
- Theater fire, 97:3.29
- Warehouse fire, 93:6.85, 93:6.86, 96:6.68, 98:6.87
- Wood product manufacturing plant fire, 97:6.50
- EXTINGUISHERS, PORTABLE, DRY CHEMICAL**
 - Empty, missing extinguishers in warehouse fire, 91:2.33
 - Limited success, warehouse fire, 98:5.18
 - Successful use of
 - Deep fat fryer fire, 92:5.25
 - Electric vault fire, 95:5.35
 - Foundry fire, 91:1.31
 - Hospital fire, 98:5.17
 - Laboratory fire, 97:5.23
 - Magnesium smelting operation fire, 93:3.34
 - Power plant fire, 96:6.72
 - Restaurant fire, 94:3.28
 - School fire, 93:4.28, 95:3.39
 - Store fire, 92:6.25
 - Unsuccessful use of
 - Automotive parts manufacturing plant, 98:6.85
 - Christmas tree fire, 91:6.24, 95:6.36
 - Detention center fire, 95:5.33
 - Food processing plant fire, 96:6.64
 - Hotel fire, 95:2.29
 - Insulation fire, 91:6.23
 - Knitting mill fire, 98:6.84
 - Office building fire, reignites after use, 97:6.53
 - Store fire, 94:6.35
 - Tar fire, 91:6.23
- EXTINGUISHING SYSTEMS. See SUPPRESSION SYSTEMS**
- F**
- FAIRFAX COUNTY, VIRGINIA**
 - Fire and Rescue Department response to CIA shooting incident, 94:1.77
- FALSE ALARMS. See ALARMS, FALSE**
- FANS**
 - Factor in fire spread, 93:6.27, 84, 94:5.97
 - Fires caused by (*See ELECTRICAL EQUIPMENT FIRES*)
- FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)**
 - Disaster management role, 95:4.46
- FILMS, NFPA**
 - Senior fire safety with Jonathan Winters, 91:2.44
- FIRES**
 - Earthquakes as cause of (*See EARTHQUAKES AND SUBSEQUENT FIRES*)
- FIRE AND THE ENVIRONMENT. See ENVIRONMENT**
- FIRE BARRIERS. See also WALLS, FIRE**
 - Inadequate, factor in fatal fire, 95:5.36
 - Lack of, factor in fatal fire, 93:2.44

NFPA Journal
10 Year Index 1987-1997

- In structural joints, 91:2.98
- FIRE BRIGADES, INDUSTRIAL**
 - Alarm delayed while brigade fought fire, 93:6.83
 - Chemical plant fire controlled by, 96:3.39
 - Limit fire spread in chemical plant fires, 96:6.64
 - Members die in catastrophic fire, 96:5.94
 - NFPA 600 requirements, 92:2.46
- FIRE COMMAND COLUMNS**
 - Deploying resources effectively, 92:6.104
 - Fire critiques, effective, characteristics of, 91:3.152, 91:4.106
 - Fire critiques, standard review items, 91:6.104
 - Fire critiques, steps in assembling, 91:5.109
 - Fire critiques as evidence for lawsuits, 92:1.18
 - Fire service management modeled on fireground management, 91:2.144
 - Matching response capabilities to fire conditions, 92:4.30
 - Shrinking budgets, staffing realities, 92:3.28
 - Standard operating procedures reduce legal risk, 92:2.30
 - Urban violence complicates fire service operations, 92:5.14
- FIRE CRITIQUES**
 - Characteristics of effective critiques, 91:3.152, 91:4.106
 - Lawsuits, use in, 92:1.18
 - Standard review items, 91:6.104
 - Steps in assembling, 91:5.109
- FIRE DEATHS, U. S.. See also CATASTROPHIC FIRES; FIRE FIGHTER FATALITIES**
 - Building security measures contribute to fire deaths, 94:3.110
 - Civilian deaths, 1994, 95:5.93
 - Civilian deaths, 1995, 96:5.52
 - Civilian deaths, 1996, 97:5.76
 - Civilian deaths, 1997, 98:5.72
 - Of elderly, causes and prevention, 91:2.36
 - Factors contributing to deaths, 94:3.99
 - Risk of fire fatalities higher for elderly, 97:1.44
 - Smoke and burns compared as fire death causes, 95:1.38
 - Smoking materials as leading cause, 1980-88 overview, 91:1.86
- FIRE DOORS. See DOORS, FIRE**
- FIRE DRILLS**
 - NFPA "Great Escape" promotes home fire drills and escape plans, 98:3.74, 4.32
 - School, planned programs, 91:2.24
- FIRE FIGHTER FATALITIES**
 - Apartment building fire, N. Y., N. Y., March 28, 1994, 95:6.85
 - BLEVE, LP-Gas tank, Iowa, April 9, 1998, fire investigation report, 98:6.42
 - Chemical packaging and storage facility, Arkansas, May 8, 1997, 98:5.53
 - False alarm-related, U. S., 1984-1993, 95:1.48
 - Furniture refinishing plant fire, Dec. 20, 1991, 92:3.73
 - Heart attacks, resulting from, 93:2.73
 - High-rise building fires, 92:5.56
 - High-rise club/hotel fire, Indianapolis, Ind., Feb. 5, 1992, 92:6.31
 - High-rise office building fire, Philadelphia, Pa, Feb. 23, 1991, 91:5.64
 - Identifying and mitigating fireground risks to avert firefighter fatalities, 98:4.70
 - Office building fire, Denver, Colo., Sept. 28, 1992, 93:2.33
 - Ten year analysis, 1984-1994, 94:4.62
 - U. S., 1990 report, 91:4.46
 - U. S., 1991 report, 92:4.40

NFPA Journal
10 Year Index 1987-1997

- U. S., 1992 report, 93:4.44
- U. S., 1993 report, 94:4.55
- U. S., 1994 report, 95:4.83
- U. S., 1995 report, 96:4.63
- U. S., 1996 report, 97:4.46
- U. S., 1997 report, 98:4.50
- Wildland fire fighting rules to prevent fire fighter fatalities, 94:3.33

FIRE FIGHTER INJURIES

- 1990 report, 91:6.42
- 1991 report, 92:6.56
- 1992 report, 93:6.56
- 1993 report, 94:6.57
- 1994 report, 95:6.63
- 1995 report, 96:6.103
- 1996 report, 97:6.66
- 1997 report, 98:6.48

FIRE FIGHTER SAFETY

- Analyze risk before risking lives, 95:1.21
- Command safety guidelines, 91:1.74
- Fire fighting demands aerobic fitness, 93:2.68
- Hantavirus poses health threat to wilderness fire fighters, 94:2.31
- NFPA 1500, *Fire Department Occupational Safety and Health Program*, keeps personnel safe, 97:4.74
- NFPA 1971, *Protective Ensemble for Structural Fire Fighting*, 1997 edition, consolidates testing, performance requirements for structural fire fighting ensemble, 97:6.62
- Reconciling safety and customer service needs, 92:4.86
- Urban problems confront fire service, 93:2.14
- Wildland fire fighting personnel qualifications, NFPA standard, 94:1.33
- Wildland fire fighting rules to prevent fire fighter fatalities, 94:3.33
- Working in pairs as a fundamental safety concept, 93:2.33

FIRE FIGHTER TRAINING

- Fire fighter injuries related to, 98:6.55
- Hazardous materials incidents use new training regimens, 95:2.90
- Hazardous materials training programs' effectiveness questioned, 95:4.27
- NFPA introduces training seminars at 1997 Fall Meeting, 98:2.64
- State fire training methods, 95:1.61
- Stress, fear, of wildland fires counteracted by training, 95:4.41
- System operation training for fire fighters; review of literature, 94:3.59
- Truck company duties need emphasis, 95:5.19

FIRE FIGHTING, INTERNATIONAL

- Japan, 91:5.51
- Soviet Union, 91:6.66

FIRE INJURIES. See also FIRE FIGHTER INJURIES

- Civilian, 1996, 97:5.76

FIRE INSPECTIONS

- Inspectors now must be highly skilled professionals, 97:1.84
- NFPA Fire Inspector Certification program, 91:3.57
- NFPA introduces Fire Inspector I Certification Program, 98:3.116
- Required inspections determined by life safety evaluation, 95:1.57

FIRE INVESTIGATIONS

- Apply mutual aid to fire investigations, 93:1.14
- Bureau of Alcohol, Tobacco, and Firearms National Response Teams aid in catastrophic fire investigations, 98:3.92
- Electronic information sources, new technologies aid investigators, 97:3.80

NFPA Journal
10 Year Index 1987-1997

- Fatal board and care facilities fires, 1994-1998, 98:5.34
- LP-Gas tank explosion, Albert City, Iowa, April 9, 1998, 98:6.42
- National Fire Incident Reporting System (NFIRS) and other national reporting systems, 98:3.80
- NFPA 921, *Guide to Fire and Explosion Investigations*, as authoritative treatise for litigation, 96:2.40
- Thailand, Royal Jomtien Hotel, July 11, 1997, 98:2.34
- FIRE LOSS, U. S.. *See also* LARGE-LOSS FIRES, U. S.
 - 1990 report, 91:5.36
 - 1991 report, 92:5.32
 - 1992 report, 93:5.78
 - 1993 report, 94:5.57
 - 1994 report, 95:5.93
 - 1995 report, 96:5.52
 - 1996 report, 97:5.76
 - 1997 report, 98:5.72
- FIRE MODELS
 - Alternative designs evaluated using, 95:2.68
 - Backdraft incident, apartment building fire, March 28, 1994, N. Y., N. Y., 95:6.85
 - Computer fire model, overview, 91:2.60
- FIRE PREVENTION WEEK
 - 1991 theme: fire escape planning, 91:5.34
 - 1992 theme: smoke detectors are lifesavers, 92:5.68
 - 1993 week is culmination of year's fire safety education efforts, 93:5.89
 - 1995 theme: watch what you heat (home fire causes), 95:5.77
 - 1998 theme: "Great Escape" promotes home fire drills and escape plans, 98:3.74, 4.32
 - History of, 95:4.71
 - "Sparky" speaks out; interview with fire prevention mascot, 94:5.66
- FIRE PRODUCTS
 - Fire fighter fatalities related to, 52, 91:4.53, 90, 92:4.46, 48, 50, 51, 54, 93:4.50, 94:4.57, 67, 68, 69, 96:4.71, 72, 75, 76, 97:4.59, 98:4.59, 60, 62
 - Fire fighter injuries related to, 91:6.49, 51, 52, 53, 92:6.62, 63, 64, 65
- FIRE PROTECTION
 - Future of, 1991 overview, 91:3.38
 - Future of, NFPA Board of Directors view, 92:1.47
 - Stadium fires demonstrate unique protection problems, 94:4.49
- FIRE PROTECTION ENGINEERS
 - International higher education programs developed, 93:1.43
 - Recruiting and retaining fire department FPEs, 93:1.58
- FIRE PROTECTION HANDBOOK
 - 17th edition, overview, 91:3.106
 - 18th edition, overview, 97:1.66
- FIRE PROTECTION PROGRAMS
 - Soviet Union, 91:6.66
- FIRE PROTECTION SYSTEMS
 - Chrysler Corp. Technology Center, 95:3.129
 - Explosion destroyed, factor in fire spread, 94:5.104
 - High-rise buildings, design of systems for, 94:2.36
 - Passive systems, value of, 97:2.30
 - Underground SubTropolis storage/manufacturing facility, Kansas City, Missouri, requires unique systems, 98:6.68
 - Users' manuals needed to document building systems, 98:4.26
 - Washington, D.C. airports equipped with state-of-art systems, 98:4.80
 - Water mist systems, 94:3.46

NFPA Journal
10 Year Index 1987-1997

FIRE PUMPS

Failure to operate automatically, 92:2.25

FIRE SAFETY. See also FIRE SAFETY EDUCATION

Americans underestimate fire risk, 96:3.77

Checklists for home, workplace, child fire safety, 97:1.104

"Contract with America"'s effect on fire safety, 95:3.46

Detectors distributed free by fire department saves residential occupants, 98:3.38

Fire service public service programs, 95:1.70

Health care facilities' fire safety prognosis for '90s, 92:3.89

High-rise buildings, fire safe design for, 93:6.4

Implications of home security systems; editorial, 94:3.4

Industrial fire safety programs, establishment of, 93:2.12

Navajo Nation and NFPA Center for High-Risk Outreach cooperate for fire safety,
97:2.74

NFPA general manager Percy Bugbee's fire safety efforts, 95:6.77

Outside U. S., citizens held responsible for fires, 96:3.83

Partnership of owners, designers, and public officials necessary for fire safety, 93:1.12

Performance-based fire safety design code development, 94:6.16

Performance-based fire safety design codes coming to North America, 94:3.70

Politics of fire safety regulations at local to federal levels, 98:4.29

Safety principles for disabled persons, 96:4.112

Sprinkler systems' importance for fire safety, 93:1.53

Summer fire hazards, 97:4.96

U. S. Consumer Products Safety Commission addresses fire safety issues, 98:3.49

United States should hold citizens responsible, 95:4.38

FIRE SAFETY EDUCATION. See also FIRE PREVENTION WEEK; OUTREACH COLUMNS

Board and care facility staff, residents untrained, factor in catastrophic fire, 93:5.66

College students need safety training, 97:5.34

Dick Van Dyke's contribution to Learn Not to Burn, 96:1.70

Fire fighters work with youth through Big Brothers/Big Sisters program, 98:2.28

Fire service public service programs, 95:1.70

Fireworks education program result of illegal fireworks fire, 96:4.22

First NFPA public service announcement campaign, 1950, 95:6.74

In-service programs for teachers, 91:4.35

KFN-TV teaches fire safety to kids, 93:5.90

Learn Not to Burn champions, 1994, 94:3.67

Learn Not to Burn champions, 1995, 95:5.103

Learn Not to Burn programs, NFPA commitment to, 93:4.4

Navajo Nation fire safety awareness campaign, 96:5.71

NFPA Champion Award Program provides age-appropriate fire safety education,
97:3.45

NFPA "Great Escape" promotes home fire drills and escape plans, 98:3.74, 4.32

Other countries' programs compared to U. S., 96:3.81

Preschool program saves lives in dwelling fire, 92:2.28

Preschooler fire safety education, 97:2.112, 3.45

Preschoolers learn fire safety in Portland, Oregon, Head Start program, 94:1.67

Proactive safety leadership role for fire departments, 91:6.93

Public education for wildfires, 91:4.32

Public education is long-term answer to fire loss, 93:6.14

Risk Watch addresses eight preventable injuries most threatening to children, 97:4.33

Risk Watch curriculum goals, implementation, and evaluation, 98:5.84

Risk Watch demonstrates value of team work for fire safety, 98:2.30

Risk Watch is useful tool as fire service's mission expands, 98:6.32

NFPA Journal
10 Year Index 1987-1997

Risk Watch's injury prevention curriculum teaches safe fun, 97:5.58
Safe Cities, Learn Not to Burn program for 10 cities, 95:3.75
Spanish-language versions of Learn Not to Burn Curriculum for Hispanic/Latino populations, 98:4.30

Sparky's new public service announcements, 96:5.40
Teaching safety to disabled persons, 96:4.112

FIRE SAFETY UPDATE COLUMNS

Fire Prevention Week, 1991 theme: fire escape planning, 91:5.34
In-service programs for teachers, 91:4.35
Juvenile Firesetter Program, Phoenix, Ariz., 91:1.22
School fire drills, planned programs for, 91:2.24

FIRE SERVICE ADMINISTRATION. See also FIRE CRITIQUES; LEADERSHIP COLUMNS; MANAGEMENT MATTERS COLUMNS

Administrators' role in fire code development, 96:1.27
Budget negatively impacted by internal departmental conflict, 94:4.112
Burdens of command responsibilities, 95:4.23
Chiefs' responsibility to network with external groups, 94:5.17
Combination career/volunteer departments, 91:3.36
Comprehensive fire protection systems, 91:4.16
Computer software for, 91:3.90
Defining the problems of fire services, 93:2.30
Denver, Colo. Fire Department is progressive, innovative, 95:3.118
Deploying resources effectively, 92:6.104
Discipline promotes effective performance, 93:2.85
Educating municipal officials about resource needs, 93:1.80
Encouraging participation in fire service organizations, 93:3.136
Fire inspection requirements determined by life safety evaluation, 95:1.57
Fireground management as model for, 91:2.144
Funding alternatives for volunteer departments, 93:5.120
Harvard program provides leadership skills, 96:3.93
Labor relations eased by seeing both sides, 94:2.13
Laughter as workplace morale booster, 91:2.116
Leaders should encourage cooperation, 94:3.164
Leaders should lead by example, 93:4.83
Leadership: what is it?, 94:1.96
Leadership requires political savvy, 95:6.21
Leadership takes many forms, 94:2.112
Leadership training, developing professional programs for, 93:4.14
Liability for negligent fire fighting activities, 97:2.38
Listening and responding to fire service members, 94:1.13
Management concerns, overview of, 91:3.17
Management reviews, 92:3.124
Marketing fire service to gain public support, 92:1.90
Marketing fire service via improved public relations, 92:1.67
Member evaluation of fire department, 95:4.28
Membership input to volunteer fire department decisions, 94:1.20
Mission statement core of operating plan, 94:4.15
New service areas can generate revenue, develop partnerships, serve customers, 96:4.38
NFPA survey, wildfire managers top concerns, 92:5.96
NFPA survey of U. S. fire departments, 93:4.59
Officer training is key to fire service success, 93:3.26
Orange County, Fla., Fire and Rescue Service operates as a consolidated force, 93:2.63
Orlando Fire Department, Fla., offers innovative service to tourist center, 93:2.59
Participatory management enhances volunteer morale, 92:1.96

NFPA Journal
10 Year Index 1987-1997

- Peer mediation, San Francisco Fire Department, 91:3.62
- Politics of fire safety regulations at local to federal levels, 98:4.29
- Pride as factor in volunteer department morale, 94:3.18
- Public information officer can improve media coverage, 94:6.25
- Regionalization and other answers to department downsizing, 93:3.30
- Shrinking budgets, staffing realities, 92:3.28
- Specialization of support services, Fort Worth, Tex., 91:2.78
- Splinter groups, effect of, 91:2.19
- Truck company duties need emphasis in training, planning, 95:5.19
- User fees implemented to recover cost of services, 97:2.66
- Volunteer fire departments, contracting with, Austin, Tex., 91:2.104
- Volunteer fire officers, 91:2.114
- Volunteer training accomplished with flexibility, technology, 94:5.18
- FIRE SERVICE APPARATUS AND EQUIPMENT. *See also* PERSONAL PROTECTIVE EQUIPMENT**
 - Development of NFPA standards for, 92:2.41
 - Fire fighter fatalities related to, 91:4.53, 55, 92:4.43, 48, 51, 54, 93:4.46, 53, 68, 69, 94:4.57, 61, 63, 66, 69, 95:4.90, 96:4.71, 72, 74, 75, 97:4.51, 55, 57, 58, 98:4.62
 - Fire fighter injuries related to, 91:6.49, 50, 51, 52, 92:6.58, 63, 64, 93:6.58, 63, 64, 94:6.65, 95:6.65, 68, 69, 96:6.108, 110, 97:6.73, 98:6.54, 55
 - Robot use pioneered in Tokyo, 92:2.67
 - St. Louis, Mo., purchases all new apparatus, 91:1.98
- FIRE SERVICE COMMUNICATIONS**
 - Engine companies lacked radio communications, 91:6.74
 - Hampered by power shut-off, 91:1.27
 - Lack of 911 service factor in building-under-renovation fire, 91:4.31
 - Overwhelmed by incoming calls, 91:6.74
 - Radio communications hampered by static, garbled transmission, 91:6.73
- FIRE SERVICE FACILITIES**
 - Renovation of, St. Louis, Mo., 91:1.94
- FIRE SERVICE OPERATIONS. *See also* FIRE SERVICE OPERATIONS HAMPERED; MUTUAL AID RESPONSE**
 - At asbestos abatement site fires, 92:3.55
 - Command safety: a wake-up call, 91:1.74
 - Electrical inspections threatened by budget cutbacks, 96:6.80
 - Fire fighter injuries related to, 98:6.56
 - Fire fighting challenges of San Francisco, Calif., fire department, 94:3.119
 - Fire station response and support specialization, Fort Worth, Tex, 91:2.78
 - Fireground behavior after fire is out, 95:6.26
 - Good fire service requires team effort, 93:4.96
 - Hazardous materials incidents require new training, management skills, 95:2.90
 - Identifying and mitigating fireground risks to avert firefighter fatalities, 98:4.70
 - Initial attack capability, evaluation of, 96:5.29
 - Initial response (*See* FIRST RESPONSE COLUMNS)
 - Liability for fire ground decisions, 93:4.40
 - Liability for negligent fire fighting activities, 97:2.38
 - Matching response capabilities to fire conditions, 92:4.30
 - NFPA 1500, *Fire Department Occupational Safety and Health Program*, valuable tool in fire fighter safety, 97:4.74
 - Public service programs offered by fire services, 95:1.70
 - Speed bumps' effect on response times, 97:1.78
 - Urban problems confront fire service, 93:2.14
 - Urban violence complicates, 92:5.14

NFPA Journal
10 Year Index 1987-1997

FIRE SERVICE OPERATIONS HAMPERED. *See also* DROUGHT; WIND

Access limited

- Blocked doors, 93:5.62
- Burned stairs, 102
- Burning, charged electrical wire, 93:5.36
- Cargo shift in aircraft fire, 92:6.79
- Ceilings, barred/covered windows, 92:3.31
- Chicken-wire partitions in attic, 91:3.26
 - To concealed spaces, 96:1.24
- Confined space, 93:2.33, 94:6.91, 95:6.98
- Difficult-to-open doors, 92:6.26
- Fence, 93:2.21
- Fire lane chains, 95:4.37
- Flooding, 92:4.72, 98:6.88
- Location/size of other buildings, collapsed wall, 91:6.37
- Locked doors, 91:1.29, 91:4.68, 92:4.70, 93:4.28, 93:5.62, 94:2.27, 94:6.93
- Locked gate, 98:6.90
- Nailed-shut door, 95:3.37
- Offshore fire, 94:6.98
- Onlookers blocked roads, 97:4.20
- Overhead obstructions, 98:6.90
- Parked vehicles, 93:3.33, 93:6.84
- Relocated driveway, 97:5.24
- Road of poor quality, 91:3.27
 - To roof, ceiling voids, 92:5.30
- Security devices, 91:4.25, 91:4.26, 97:5.51
- Security gates, chains, 93:6.79, 97:6.56
 - To site, 91:6.73, 92:1.26
- Stairway fire, 97:5.21
- Stored furniture, 92:4.67
- Stored goods, 92:6.79, 93:2.19, 94:6.96
- Street layout, 91:6.74
 - To two sides of building, 95:6.107
- Waterfront location, 93:6.81
 - To wildland fire site, 94:6.99, 95:6.111
- Aerial ladder lacking, 95:6.106
- Apparatus, fire fighters at earlier fire, 93:3.34
- Bystanders interfered, 92:4.70, 93:2.19
- Ceiling collapse, 94:6.89, 96:3.35, 98:1.21
- Chemicals prevented use of water, 94:6.95
- Civil disturbance threatened fire fighter safety, 93:5.67, 93:6.81
- Communications hampered
 - Lack of 911 service, 91:4.31
 - Overwhelmed by incoming calls, 91:6.74
 - Power shut-off, 91:1.27
 - Radio communications limited, 91:6.74
 - Radio static, garbled transmissions, 91:6.73
 - Size of fire area, 97:6.58
 - System disabled, 94:6.90
- Deteriorating conditions force defensive attack, 98:2.19, 20
- Electrical power loss, 91:5.64, 92:4.71, 92:5.56, 92:6.74, 78, 94:5.104, 94:6.90
- Electrical transformers, high-voltage lines nearby, 96:6.72
- Emergency lighting failed, 92:6.78
- Emergency shutdown procedure caused delay, 94:6.92

NFPA Journal
10 Year Index 1987-1997

Energized electrical equipment concern, 94:6.91
Explosions of equipment, fuel, 97:6.50
Explosions of gas cylinders, 94:6.36
Explosions of materials, 95:6.104
Fire operations control center damaged, 94:5.104
Fire protection systems damaged, 94:5.104
Fire spread, rapid, 97:6.58
Fire spreading behind fire fighters, 94:6.36
Flashback fires on cargo containers, 92:6.79
Flashover forces exterior attack, 98:4.22
Floor collapse, 93:2.33, 96:5.96, 97:3.30
Foam suppression supplies exhausted, 92:1.60
Fog, fuel leak on runway, 91:3.69
Hazardous materials, by presence of, 91:6.75, 92:3.33, 95:5.35, 95:6.38
Heat and smoke conditions hampered entry, 94:2.27
Heat forced exterior attack only, 93:2.20
Heat hampered entry, 97:6.49, 50, 57
Hose lines too short, 97:1.27, 5.23
Hydrant failed, 95:4.37
Hydrants at distance, 91:3.27, 93:6.88, 95:6.99, 107
Hydrants frozen or inoperative, 95:6.100, 96:6.72
Information on exposure not available, 94:3.30
Large number of fires, 96:3.36
Large number of occupants hamper rescue, 94:5.95
Large size of building, 94:6.97
Large size of fire, 95:6.104, 107
Local response capability limited, 94:3.30, 96:3.36
LP-Gas tanks had to be protected, 93:6.84
Machinery, hazards posed by operating, 92:5.30
Multiple exposures affected control efforts, 94:3.27
Noise limited communications, 96:6.72
Nursing home patients in restraints slow rescue, 91:4.67
Oil and water on floor, 96:6.72
Outdated fire plans, 92:6.26
Propane tank vented, 96:6.73
Propane trucks at fire site, 94:6.96
Remote location, 92:1.23, 93:3.36, 93:4.26, 93:5.67, 94:6.90, 99, 95:6.111, 96:4.21, 96:6.64
Rescue operation took precedence, 94:6.91
Response delayed, 94:4.31, 95:3.37, 38
Roof, fire broke through, 97:5.21
Roof collapse, 93:6.29, 83, 94:6.95, 96, 95:6.37, 100, 103, 106, 107, 108, 96:6.70, 97:6.19, 1.21, 98:5.18, 6.89
Roof layers, fire between, difficult to reach, 97:6.21
Roof thickness delayed venting, 95:6.106
Rugged terrain, 92:6.76, 97:5.54, 6.59, 98:6.92
Rural location, 91:4.65, 67, 92:4.67
Safety of area had to be determined, 95:4.40
Smoke density, 92:6.76, 94:6.94, 96, 95:6.107, 96:6.63, 65, 97:6.49, 50
Staffing limited, 92:4.25, 92:6.78
Standpipe connections lacking, 94:6.92
Steep terrain, 93:6.88, 94:6.99
Storage configuration, 98:6.85, 91

NFPA Journal
10 Year Index 1987-1997

- Structural collapse, 92:4.71, 92:6.75, 94:5.95, 94:6.94, 95:3.40, 95:6.103, 104, 107, 97:5.23, 6.56, 5.18, 98:6.84
- Structural collapse threatened, 94:5.30, 95:3.37, 95:4.39, 95:5.35, 36
- Structural fire fighting equipment lacking, 94:4.31
- Suppression resources in use at other fires, 94:6.99
- Swampy, combustible terrain, 93:3.36
- Transformer circuits checked for power shutoff, 98:1.22
- Ventilation openings lacking, 98:6.91
- Wall collapse, 92:6.78, 96:6.70
- Water pressure inadequate, 91:5.64, 91:6.74, 92:4.71, 92:5.56, 92:6.74
- Water storage problems, 91:6.73
- Water supply
 - Connection covered by shed, 96:5.94
 - Connections damaged, 96:5.94
 - Disrupted by explosion, 92:6.75
 - Hydrant malfunction, limited by, 98:6.92
 - Inadequate, 91:1.27, 54, 91:3.27, 91:4.26, 91:6.74, 75, 92:2.26, 92:4.25, 26, 92:5.30, 92:6.79, 93:6.29, 94:4.30, 94:4.31, 94:5.29, 94:6.36, 94:6.90, 92, 97, 95:3.37, 95:4.37, 95:6.106, 107, 96:6.64, 65, 70, 97:5.24, 6.50, 56, 57, 58, 98:6.86
 - Out of service, 96:6.73
 - Piping damaged, 94:5.104, 96:5.24
 - Remote, 92:6.26, 97:1.28, 6.59
- Water-repellant burning material, 98:6.85
- Weather
 - Fog, 91:3.69
 - High temperature, 91:6.78, 92:4.25, 93:6.89, 95:5.67, 95:6.111, 96:4.21, 96:6.73, 97:3.30, 4.21
 - Low temperature, 91:1.27, 92:1.26, 60, 92:6.26, 95:6.68, 96:6.62, 96:6.72
 - Rain, 92:4.72
 - Winter, 91:6.73, 93:6.81, 95:6.100, 106, 97:5.54, 6.50, 57, 59
- Window lexan layer hard to penetrate, 94:6.89
- FIRE SERVICE RESCUE AND EXTRICATION**
 - Alfred P. Murrah Federal Building, Oklahoma City, Oklahoma, April 19, 1995, 96:1.50, 59, 96:5.94, 96:6.69
 - Electric generating station fire, 94:6.91
 - Fire fighter fatalities related to, 1990, 91:4.51, 53, 58
 - Fire fighter injuries related to, 91:6.50, 96:6.107, 108, 98:6.56
 - Large number of occupants hampers rescue, 94:5.95
 - Los Angeles County Fire Department search and rescue program meets diverse demands, 95:6.55
 - Nursing home patients in restraints slow rescue, 91:4.67
 - Office building complex fire, 94:6.90
- FIRE TESTS**
 - Adequacy and validity of existing tests, 94:2.14
 - European Community product testing standards will affect U. S. building materials, 92:5.45
- FIRE WALLS. See WALLS, FIRE**
- FIRE WATCHES**
 - Meeting hall fire, 98:1.21
 - Transformer fire, 98:1.22
- FIREPLACES**
 - Construction fault results in ignition of floor joists, 93:6.81
 - Diesel fuel ignites fire, 92:2.29

NFPA Journal
10 Year Index 1987-1997

Embers ignite couch, 96:5.91
Lighter fluid used to rekindle fire, 96:1.23

FIRES

Explosions and (*See* EXPLOSIONS AND FIRES)
Myths of fire, 94:6.67

FIRESTOPPING. *See also* THROUGH-PENETRATION PROTECTION SYSTEMS

Clarification of industry's terminology, 96:2.79
Lack of, factor in fire spread, 92:4.25, 95:4.37, 96:6.65, 98:1.21

FIREWATCH COLUMNS, 91:1.27, 91:2.29, 91:3.25, 91:4.25, 91:5.25, 91:6.23, 92:1.21, 92:2.25, 92:3.31, 92:4.25, 92:5.25, 92:6.25, 93:1.25, 93:2.19, 93:3.33, 93:4.25, 93:5.35, 93:6.27, 94:1.29, 94:2.27, 94:3.27, 94:4.29, 94:5.27, 94:6.33, 95:1.31, 95:2.29, 95:3.37, 95:4.37, 95:5.33, 95:6.35, 96:1.21, 96:2.23, 96:3.35, 96:4.21, 96:5.23, 96:6.21, 97:1.25, 2.21, 3.29, 4.19, 5.21, 6.19, 98:1.21, 2.16, 3.36, 4.19, 5.15, 6.21

FIREWORKS. *See also* PYROTECHNICS

Apartment building fire cause, 97:4.20
Customer lit item in retail fireworks store, catastrophic fire cause, 97:5.52
Fire fighters injured by, 94:6.64

Illegal

Apartment building fire cause, 97:3.30
Dwelling fire cause, 92:4.26, 96:4.21, 22
Fire leads to fire safety program, 96:4.22
Garage explosion-fire cause, 91:1.31
Manufacturing plant fire cause, 95:3.40
School fire cause, 92:4.27

Manufacturing plant explosion/fire, 91:4.30, 92:4.71, 93:3.35
Overview of fire losses, casualties caused by fireworks, 92:4.56, 93:4.55, 94:4.78, 95:4.61, 96:4.79, 97:4.78

Public display

Aerial shell fails to explode, kills child, 96:4.24
Fatal explosion, fire, 96:4.24
Mortars and stored fireworks ignite fire/explosion, 98:5.55
Rocket explodes prematurely, ignites display barge, 98:4.22

Pyrotechnic device used in theater ignites net, 96:2.26

Sparkler, apartment building fire cause, 97:2.21

Statistics on incidents and safety information, 98:4.96

Text of NFPA's July 4, 1914, pamphlet against fireworks use, 95:4.81

Wildland/urban interface fire cause, 97:6.59

FIRST RESPONSE COLUMNS

Budgeting for initial response crews, 91:1.17
Community fire protection systems, 91:4.16
Dedication is bond in fire service, 93:5.128
Defining problems of fire services, 93:2.30
Educating municipal officials about resource needs, 93:1.80
Effective leaders encourage cooperation, 94:3.164
Fable offers lessons for fire service, 91:5.32
Fire service management concerns, 91:3.17
Fire service management reviews, 92:3.124
Fire service organizations need to present a united front, 93:6.128
Fire service splinter groups, 91:2.19
Good fire service requires team effort, 93:4.96
Improving fire protection despite budget limits, 92:6.14
Internal departmental conflict negatively impacts budgets, 94:4.112
Leadership: what is it?, 94:1.96

NFPA Journal
10 Year Index 1987-1997

- Leadership takes many forms, 94:2.112
- Marketing fire service to gain public support, 92:1.90
- NFPA members vote on minimum staffing issue, NFPA 1500, 92:4.96
- Positive image wins budget support, 92:2.96
- Preplanning can help withstand budget cut pressures, 94:5.128
- Proactive safety leadership role required of fire departments, 91:6.93
- Regionalization and other answers to department downsizing, 93:3.30
- Safe Place program for young people, 94:6.128
- FIRST RESPONSE (EDITORIAL) COLUMNS. *See* EDITORIALS
- FISH HATCHERY COMPLEX FIRE, LEAVENWORTH, WASH.
 - Wildland fire, 1994, 95:2.48
- FLAME DETECTORS. *See* DETECTORS, FLAME
- FLAMMABLE, COMBUSTIBLE LIQUIDS
 - Storage lockers for hazardous materials with characteristics of, 94:5.71
- FLAMMABLE, COMBUSTIBLE LIQUIDS FIRES. *See also* ACCELERANTS;
GASOLINE; HEATING-AND-COOKING EQUIPMENT FIRES; LP-GAS FIRES;
OIL; PROPANE; VAPORS, FLAMMABLE
 - Aircraft fuel ignited by electric arc, 94:5.106
 - Aircraft fuel ignited by engine, 98:4.22
 - Aircraft fuel ignites after crash, 95:6.110
 - Airport fuel ignited by unknown source, 91:6.73
 - Alcohol, possible misused in kerosene heater, fatal fire cause, 98:2.16
 - Alcohol ignited in truck/train collision, 91:4.70
 - Charcoal lighter ignites catastrophic fire, 96:5.97
 - Charcoal lighter used to ignite chair, 91:5.28
 - Class II liquid fuel ignited in locomotive fire, 98:6.91
 - Diesel fuel fuels railroad car fire, 96:5.101
 - Diesel fuel ignited by hot manifold, 91:2.30
 - Duplicating fluid spills, ignited by match, 94:2.30
 - Floor stripper vapors ignited, 94:5.105
 - Furniture refinishing liquids ignite combustibles in catastrophic fire, 92:4.71
 - Furniture refinishing liquids ignite trash, 95:6.38
 - Glue, spilled, ignited by arc from extension cord, 98:4.20
 - Glue overheats, ignites, 93:4.27
 - Heat transfer fluid (HTF) ignited by gas heater, 91:6.76
 - Ink, in drums, ignited, 95:6.107
 - Kerosene, stored, contributes to spread of catastrophic fire, 94:5.96
 - Kerosene fuels catastrophic fire, 92:4.69, 96:5.92
 - Kerosene spill ignited by lamp in fatal fire, 97:6.20
 - Lacquer overheats, ignites catastrophic fire, 91:2.31
 - Lacquer thinner vapors ignited by pilot light, 94:5.104
 - Lantern fuel ignited by space heater, 94:3.28
 - Molotov cocktails used to ignite incendiary fire, 30
 - Naptha feed overheats, releases, ignited by furnace, 96:6.64
 - Oils, glue, dye saturated floor, increased fire spread, 94:6.98
 - Paint thinner used to ignite school fire, 91:3.27
 - Pentane ignited by electrical arc from forklift controls, 91:6.26
 - Resin and catalyst leaked onto fiberglass matting to create heat reaction, 93:5.37
 - Rubbing alcohol used to ignite catastrophic fire, 92:4.67
 - Solvent in epoxy resin heated beyond flashpoint, 93:5.37
 - Stored liquids ignited by burning fragments from explosion, 95:5.66
 - Stored liquids ignited by flash fire, 93:6.27
 - Unknown liquid
 - Catastrophic fire ignited by, 91:4.64, 65, 92:4.69, 95:5.53, 58

NFPA Journal
10 Year Index 1987-1997

Fatal fire ignited by, 93:2.33
Fire ignited by, 95:5.34
Large-loss fire ignited by, 95:6.99
Plastic ignited by, 94:6.93

Unknown liquid vapors released through foam system, ignite tank fire, 96:6.66
Wood stain soaked paper towels ignite spontaneously, 98:4.21

FLAMMABLE PRODUCTS

Effectiveness of current product labeling systems, 94:1.71

FLASHOVERS

Apartment building fire, Illinois, March 20, 1995, 95:5.53
Apartment building fire, Ohio, 1996, 97:4.20
Church fire, 1989, 91:1.30
Club/hotel fire, Indiana, 1992, 92:6.31
College laboratory fire, Texas, 1996, 97:5.23
Dwelling fire, Illinois, 1997, 98:1.23
Dwelling fire, Massachusetts, 1993, 94:6.34
Dwelling fire, Pennsylvania, 1997, 98:3.38
Dwelling fire, South Carolina, Nov. 7, 1992, 93:5.64
Dwelling fire, Virginia, Jan. 20, 1996, 97:5.50
Group home fire, Illinois, 1994, 95:6.37
Hotel fire, Colorado, Jan. 27, 1997, 98:5.49
Manufactured home fire, Idaho, Sept. 27, 1997, 98:5.46
Manufacturing plant fire, Massachusetts, June 6, 1997, 98:6.86
Restaurant fire, California, 98:4.22
Rooming house fire, Ohio, Feb. 18, 1991, 92:4.67
School fire, Maryland, Oct. 24, 1993, 94:5.105
Shopping mall fire, Arkansas, 1996, 21

FLEMING, JOSEPH M.

Profile of, 98:1.37

FLEMING, RUSSELL P.

Profile of, 91:2.14

FLOORS

Collapse hinders fire fighting operations, 97:3.30
Collapse hinders rescue of trapped fire fighter, 93:2.33
Collapse traps fire fighters, 92:3.73
Fire involving, 91:1.27
Fire spread through, 94:5.96, 94:6.90
Fire started under, 97:6.50
Saturated with flammable liquids, increased fire spread, 94:6.98

FLORIDA

Adult congregate living facility fire, 1994, 95:6.35
Aircraft crash fire, Aug. 7, 1997, 98:6.91
Apartment building fire, 1990, 91:3.25
Apartment building fire, 1992, 93:1.27
Apartment building fire, 1993, 94:5.27, 94:6.33
Apartment building fire, 1996, 97:3.29
Boat fire, Apr. 19, 1996, 97:6.60
Catastrophic fires
Aircraft, Jan. 17, 1991, 92:4.72
Aircraft, May 11, 1996, 97:5.54
Automobile, Nov. 9, 1996, 97:5.55
Board and care facility, Dec. 1, 1994, 95:5.64
Dwelling, Jan. 13, 1990, 91:4.64
Dwelling, Feb. 25, 1990, 91:4.66

NFPA Journal
10 Year Index 1987-1997

- Dwelling, Oct. 15, 1990, 91:4.64
- Dwelling, March 13, 1993, 94:5.98
- Hotel, April 6, 1990, 91:4.64
- Manufacturing plant explosion, April 13, 1994, 95:5.66, 95:6.106
- Train/truck/automobile, March 17, 1993, 94:5.106
- Club fire, 1993, 94:5.30
- Detention facility fire, 1992, 93:3.33
- Disney World fire protection systems, 96:3.119
- Dwelling fire, 1992, 93:2.21, 93:5.35
- Dwelling fire, May 4, 1997, 98:6.90
- Dwelling fire, Oct. 22, 1997, 98:6.90
- Electric generating plant fire, Aug., 1995, 96:6.72
- Electric generating plant fire, July, 1992, 93:6.82
- Electric generating plant fire, June 30, 1997, 98:6.91
- Fatal fires
 - Apartment building, 1990, 91:6.24
 - Apartment building, 1995, 96:1.23
 - Board and care facility fire, December 1, 1994, fire investigation report, 98:5.37
 - Dwelling, 1993, 94:4.32
 - Hotel fire, 1997, 98:6.23
 - Manufactured home, 1990, 91:4.26, 91:5.28
 - Manufactured home fire, 1997, 98:4.20
 - Storage facility, 1990, 91:3.29
- Hotel fire, 1993, 94:2.29
- Hotel fire, 1994, 95:2.29
- Manufacturing plant fire, 1992, 93:5.37
- Manufacturing plant fire, Nov., 1993, 94:6.94
- Manufacturing plant fire, Sept. 5, 1996, 97:1.28, 6.50
- Restaurant fire, 1994, 95:2.31
- Restaurant fire, 1996, 97:3.29
- School fire, 1993, 94:1.29
- Ship fire, Aug., 1993, 94:6.98
- Shopping mall fire, Sept. 6, 1996, 97:6.53
- Store fire, 1993, 94:4.30, 94:5.30
- Store fire, Jan., 1993, 94:6.91
- Store fire, Oct. 25, 1997, 98:6.89
- Store fire, Oct. 26, 1996, 97:6.54
- Theater fire, 1995, 96:2.26
- Tornadoes strike five counties, Feb. 22, 1998, emergency response, 98:3.60
- Warehouse fire, Jan., 1995, 96:6.68
- Wildland fire, 1992, 93:3.36
- FOAM EXTINGUISHING AGENTS AND SYSTEMS**
 - Aircraft fires extinguished with, 95:6.110
 - Aqueous film-forming, on fuel tank fire, 91:6.73
 - Electrical substation plant extinguished with, 95:6.100
 - Electronic equipment repair plant fire extinguished with, 95:6.108
 - Locomotive fire, use on, 98:6.91
 - NFPA report on foam and environment, 95:3.67
 - Oil fire extinguished with, 94:6.94
 - Polyurethane foam manufacturing plant fire, use on, 98:6.21
 - Ship fire extinguished with, 94:6.98
- FOAM INSULATION. See INSULATION**
- FOAM RUBBER OR POLYURETHANE**
 - Catastrophic rooming house fire, ignited in, 92:4.67

NFPA Journal
10 Year Index 1987-1997

- Manufacturing plant fire, 98:3.41
- Manufacturing plant fire, ignited in, 95:6.107
- Manufacturing plant fire, self-ignited in, 98:6.21
- Seat cushions, back ignited by accelerant, 95:6.104
- Stored foam products ignited by light fixtures, 98:1.25
- Stored polyurethane "buns" ignited by hot exhaust manifold, 91:5.30
- FOREST FIRES. *See* WILDLAND FIRES
- FORKLIFT FIRES
 - Brake overheats, ignites combustibles, LP-Gas tank, 96:6.63
 - Electric malfunction ignites warehouse fire, 92:6.75
 - Electrical arc from controls ignited pentane, 91:6.26
 - Exhaust manifold of unmanned forklift ignited stored polyurethane, 91:5.30
 - Forklift hits aerosol containers which explode, 96:4.23
 - Hot engine block ignited propane leaking from engine, 91:2.33
 - Jammed paper leads to overheating, 94:6.95
 - Spark ignites solvent vapors, 92:4.28
 - Vehicle collides with LPG-powered cleaner, 97:6.57
 - Vehicle hits overhead lights, sparks ignite stock, 93:6.85
 - Vehicle ruptures natural gas piping, 94:1.30, 96:6.65
- FORSMAN, DOUGLAS P.
 - Profile of, 95:4.30
- FORT WORTH, TEX.
 - Support services provided by fire stations, 91:2.78
- FOY, EDDIE
 - First person account of Iroquois Theatre fire, 95:4.75
- FRANCE
 - Eurotunnel (Channel tunnel) fire, November 18, 1996, analysis, 97:2.58
 - Fire protection for Eurotunnel (Channel tunnel), 96:1.85
- FUNERAL HOME FIRES
 - Michigan, 1995, 96:6.24
 - New Jersey, 1996, 97:2.21
- FURNISHINGS
 - 1991 *Life Safety Code* regulations, 91:4.20
 - Block door in catastrophic fire, 93:5.62, 94:5.96, 95:5.59
 - Blocks windows in catastrophic fire, 92:4.69
 - Chair ignited by smoking materials in catastrophic fire, 94:5.102
 - Factors affecting fire hazards of, 92:4.33
 - Fuel club/hotel fire, 92:6.31
 - Hot object ignites wood table in catastrophic fire, 94:5.97
 - Ignited in catastrophic fire, 94:5.100
 - Railroad passenger cars, factor in catastrophic fire, 97:6.59
 - Stored furnishings block access/egress in catastrophic fire, 92:4.67
- FURNITURE, UPHOLSTERED
 - Chair
 - Child playing with charcoal lighter, ignited by, 98:4.19
 - Child playing with lighter, ignited by, 95:3.38, 97:5.50
 - Cigarette, ignited by, 68, 69, 92:4.67, 96:5.91, 98:1.23
 - Furnace heat, ignited by, 95:5.62
 - Incendiary fire, ignited by, 91:5.28, 95:6.98
 - Unknown source, ignited by, 97:5.21
 - European Commission furniture fire study, results, 96:4.84
 - Recliner, ignited by undetermined source, 94:5.100
 - Sofa
 - Accidentally ignited, 92:4.69

NFPA Journal
10 Year Index 1987-1997

Ashes, ignited by, 93:5.64
Candle, ignited by, 96:6.22, 97:5.49, 98:5.17
Child playing with lighter, ignited by, 91:4.65, 66, 91:6.24, 93:5.64, 94:5.102,
95:4.38, 95:6.36, 98:5.16
Child playing with matches, ignited by, 91:4.64, 66, 95:3.37, 98:5.16
Cigarette, ignited by, 91:3.26, 91:4.65, 66, 94:1.31, 94:5.102, 95:5.60, 96:4.24,
96:5.24, 91, 97, 97:5.50, 98:4.21, 5.46, 49
Cord short circuit, ignited by, 97:3.29
Fireplace embers, ignited by, 96:5.91
Fireworks, ignited by, 97:4.20, 98:4.19
Lamp cord short circuit, ignited by, 93:6.28
Near point of origin in catastrophic fire, 98:5.50
Open flame, ignited by, 96:3.39
Smoking materials, ignited by, 91:4.68, 95:5.56, 97:5.52, 53, 6.21
Space heater, ignited by, 95:5.58, 97:2.22
Spreading fire, ignited by, 94:5.98
Suspicious fire, ignited by, 93:5.66
Unknown cause, ignited by, 94:5.96, 95:5.54, 56, 96:5.93, 98:5.50

G

GABRIELE, ROCCO J.

Profile of, 95:2.22

**GARAGE, AUTOMOBILE REPAIR, FIRES. See AUTOMOBILE REPAIR SHOP
FIRES**

GARAGE, PARKING, FIRES

High-rise office building complex, New York, Feb. 26, 1993, 94:5.104, 94:6.90

Highway department heavy equipment garage, New York, July, 1995, 96:6.68

GARAGE, RESIDENTIAL, FIRES

California, 1992, 93:6.29

Catastrophic

California, July 22, 1991, 91:4.67

Wisconsin, April 22, 1991, 92:4.68

Massachusetts, 1996, 97:6.20

Ohio, 1989, 91:1.31

GAS. See also COMPRESSED NATURAL GAS

Ammonia line bursts, poses toxic threat to fire fighters, 93:6.85

Carbon monoxide is top hazard, 95:5.23

Hazardous incident responders need multigas detectors, 95:6.25

Natural gas, handling incidents involving vehicles fueled by, 94:4.84

Natural gas odorant filtered out by soil, 95:5.62

GAS EQUIPMENT FIRES

Clothes dryer, mop heads ignite in, 98:5.17

Clothes dryer overheats, ignites napkins inside, 98:5.18

GAS EXPLOSIONS

Coke gas with hydrogen, 95:5.64

**GAS FIRES. See also HEATING-AND-COOKING EQUIPMENT FIRES; HYDROGEN
FIRES; LP-GAS FIRES; NATURAL GAS FIRES; PROPANE**

Butane, leaking from stove fuel cylinder, ignites fire, 94:5.30

Compressed natural gas, ignited by static discharge, 94:4.29

Compressed natural gas cylinder ruptures, causing explosion and fire, 94:4.30

Fire-generated combustible gases cause flashover, fire spread, 92:6.31

Flame from LP-Gas fire causes natural gas regulator to fail, leaking gas ignites, 98:3.36

Gas compressor fire, 98:6.85

Hydrocarbon/hydrogen mixture, ignited by unknown source, 93:6.82

Isobutyl propane, ignited by electrical arc, 92:6.28

NFPA Journal
10 Year Index 1987-1997

- Oxygen fuels hospital fire, 94:5.104
- Pentane, ignited by hot plate, 92:3.33
- GAS FIRES AND EXPLOSIONS. *See also* HYDROGEN FIRES AND EXPLOSIONS; LP-GAS FIRES AND EXPLOSIONS; NATURAL GAS FIRES AND EXPLOSIONS; PROPANE**
- Acetylene, ignited by spreading fire, 94:6.36
- Ethyl alcohol vapors, ignited by torch, 93:5.67
- Hexane, vapors from leak ignited by automobile, 95:6.103
- Methane buildup ignites mine fire, 93:5.66
- Methane vapors, ignited by torch, 93:5.67, 93:6.82
- Methyl t-butyl ether ignites laboratory fire, 93:6.27
- GAS LINES**
- Hydrogen
 - Contributed fuel to fire, 94:6.91
 - Pipe connection failed, 91:5.30
 - Ruptured, ignited by friction, 94:6.36
- Natural gas
 - Contributed fuel to fire, 94:6.91
 - Distribution main over-pressured causes flare-ups, explosions, 93:5.68
 - Failed due to heat from fire, 91:4.25
 - High pressure line leaks, causes explosion, fire, 94:5.108
 - Ruptured, fuels fire, 93:6.86
 - Ruptured, gasoline ignited by spark, 93:6.29
 - Ruptured by collapsing structural members, 95:6.103
 - Service line leaks, causes explosion, fire, 95:5.62
- Propane
 - Failed, fuel catastrophic fire, 92:4.70
 - Fractured, ignited by greater, 91:3.27
- GAS STATION FIRES. *See* SERVICE STATION FIRES**
- GASOLINE. *See also* AUTOMOBILE FIRES; TRUCK FIRES**
- Candle, ignited by, 91:4.26
- Fuel leaking from vehicle tank ignited by heat from drop light, 97:6.23
- Gasoline residue on clothing ignites, 94:5.97
- Gasoline-soaked clothing used to ignite incendiary fire, 93:5.36
- Generator spark ignites fumes, 94:5.106
- Incendiary fire, used to ignite, .92, 94:5.100, 95:5.60, 66, 96:1.21, 96:5.91, 97, 98:5.50
- Kerosene heater fuel, used as; ignited bedding, 92:2.28
- Leaking fuel from punctured tanks ignites in vehicle fires, 98:5.55
- Light fixture, ignited by, 91:2.30
- Molotov cocktails used to ignite incendiary fire, 30
- Ruptured fuel tank ignites in vehicle fire, 98:5.55
- Spark, ignited by, 91:4.30
- Spark, ignited by; improper handling as factor, 91:2.31
- Spilled gasoline ignited by catalytic converter or spark in vehicle fire, 98:5.55
- Spilled gasoline vapors ignited by space heater, 97:1.26
- Storage tank pipes, ignited in truck accident, 91:2.32
- Stored gasoline and gasoline-powered yard equipment, factors in catastrophic fire, 97:5.50
- Vapors
 - Automobile fuel tank vapors ignited by pilot light, 91:4.67
 - In bilge ignite boat explosion, fire, 95:4.39
 - Boat explosion, fire ignited by, 98:3.42
 - In carburetor ignite, 98:6.89

NFPA Journal
10 Year Index 1987-1997

- Cutting torch, ignited by, 95:6.38
- Fuel line leak vapors cause boat fire, 91:4.31
- Gas furnace, ignited by, 92:6.28
- Of gasoline used for cleaning contributed to fire spread, 97:5.23
- From heated gasoline ignited by stove burner, 97:4.19
- In motor home ignited catastrophic fire, 93:5.68
- Natural gas heater, ignited by, 97:2.23
- Spilled gasoline vapors ignited by pilot light, 92:5.26, 93:2.21
- Tank storage facility ignited by, 91:3.29
- Vacuum cleaner spark, ignited by, 92:5.28
- Victims in incendiary fire ignited by, 91:4.68
- Well head ignited by spark, 93:6.29
- Wood stove, used to kindle; ignited fire, 91:4.68
- GENERAL SLOCUM EXCURSION STEAMER FIRE, N. Y., N. Y.*
- Large-loss-of-life fire, 1904, 95:4.80
- GEORGIA
- Aircraft/truck fire, May, 1991, 92:6.77
- Apartment complex fire, 1995, 96:1.22
- Catastrophic
- Dwelling, Jan. 23, 1996, 97:5.50
- Catastrophic fires
- Aircraft, Jan. 12, 1995, 96:5.100
- Aircraft, Aug. 21, 1995, 96:5.99
- Board and care facility, March 11, 1990, 91:4.67
- Dwelling, Jan. 26, 1993, 94:5.97
- Dwelling, Feb. 3, 1993, 94:5.96
- Dwelling, June 27, 1993, 94:5.98
- Dwelling, Feb. 4, 1995, 96:5.92
- Manufactured home, April 11, 1994, 95:5.56
- Office building, Jan. 12, 1995, 96:5.100
- Railroad rolling stock, Aug. 9, 1990, 91:4.72
- Truck/automobile fire, Apr. 3, 1996, 97:5.54
- Vacant club, Dec. 12, 1990, 91:4.68
- College building fire, Aug. 15, 1995, 96:6.73
- Electric generating plant fire, June, 1993, 94:6.92
- Fatal fires
- Dwelling, 1991, 92:2.29
- Dwelling, 1993, 94:1.32
- Dwelling, 1996, 97:2.22
- GEORGIA
- Manufactured home, Dec. 14, 1996, 97:5.49
- Manufacturing plant fire, 1994, 95:2.32
- Manufacturing plant fire, March, 1994, 95:6.106
- Manufacturing plant fire, Jan., 1995, 96:6.62
- Manufacturing plant fire, 1996, 97:3.33
- Manufacturing plant fire, Aug. 23, 1996, 97:6.50
- Manufacturing plant fire, Aug. 24, 1996, 97:6.52
- Manufacturing plant fire, Dec. 24, 1996, 97:6.52
- Office building fire, Jan. 12, 1997, 97:3.52
- Storage and recycling facility fire, March, 1993, 94:6.97
- Storage facility fire, March, 1993, 94:6.97
- Storage facility fire, April, 1993, 94:6.97
- Storage facility fire, Sept., 1995, 96:6.68
- Store fire, Jan, 1994, 95:6.100

NFPA Journal
10 Year Index 1987-1997

Store fire, Apr. 16, 1996, 97:6.54, 98:1.50

Store fire, Oct. 26, 1997, 98:6.89

Tank farm fire, April, 1995, 96:6.66

Warehouse fire, Jan. 26, 1990, 91:6.76

Warehouse fire, May, 1992, 93:6.86

GERMANY

Düsseldorf, fatal airport terminal fire, Apr. 11, 1996, 96:4.43

GLASS, MOLTEN

Combustible deposits ignited by, 91:6.25

Oil deposits ignited by, 93:6.27

GLATFELTER, ARTHUR J.

Profile of, 97:6.35

GLAZING

New developments offer alternatives to wired glass, also raise code questions, 98:6.76

GLENDALE, CALIF.

Wildland fire, June 27, 1990, 91:1.59

GLOBAL ISSUES COLUMNS

High-rise buildings require active fire protection, 96:6.34

NFPA alliances bring codes/standards to Spanish- and Portuguese-speaking world,
96:5.36

NFPA codes and standards can protect high-rises, 96:2.36

NFPA role in international aviation fire safety, 96:3.50

NFPA works with Asian countries to encourage recognition of codes, standards, 97:1.38

Spanish language codes and standards, 96:4.34

Spanish-speaking countries using *National Electrical Code*, 96:1.34

GONDOLA CAR FIRES

California, 1993, 94:3.28

GONZALES, RICHARD L.

Profile of, 93:6.21

GOSS, KAY

Profile of, 96:3.53

GOVERNMENT. See INSIDE THE BELTWAY COLUMNS; UNITED STATES

GOVERNMENT

GRAIN DUST

Mill and storage facility explosion, Washington, 1991, caused by, 92:4.28

GRANT, ERNEST

Profile of, 96:5.39

GRASS FIRES

Idaho, 1996, 97:4.21

Kansas, Feb. 21, 1996, 97:6.59

Texas, 1991, 92:2.28

Warehouse fire, Oklahoma, 1990, caused by, 91:4.26

GREASE FIRES

Cook room fire spreads through ventilation system, 98:6.85

Grease-covered structural components ignited, 95:6.102

Grease-covered toaster oven power terminals cause short circuit, 98:3.38

Grease-laden combustibles ignited by fan short-circuit, 95:6.106

Grease-laden rafters fuel food processing plant fire, 96:6.64

Ignites in pan, fire spreads to wood cabinets, 97:5.22

Ignites on grill in restaurant fire, 95:2.31

Ignites on portable broiler in restaurant fire, 97:4.22

Ignites on stove in apartment fire, 97:1.25

Ignites on stove in school fire, 92:6.29

Stove heat ignites grease in exhaust system, 97:6.22

NFPA Journal
10 Year Index 1987-1997

GREAT BRITAIN

Eurotunnel (Channel tunnel) fire, November 18, 1996, analysis, 97:2.58
Fire protection for Eurotunnel (Channel tunnel), 96:1.85

GREENE, OLIN L.

Profile of, 92:3.26

GREENHOUSE FIRES

Massachusetts, 1991, 92:4.25

GRINDING OPERATIONS

Sparks cause fire, 91:6.75

GROSS, CAROL

Profile of, 95:3.31

**GROUP HOME FIRES. *See also* ADULT CONGREGATE LIVING FACILITY FIRES;
BOARD AND CARE FACILITY FIRES**

Catastrophic, Texas, March 24, 1991, 92:4.70

Halfway house, Washington, 1991, 93:1.25

Illinois, 1994, 95:6.37

New Hampshire, 1990, 92:1.26

GUNSHOTS

Fire fighter fatalities related to, 94:4.63

Fire fighter injuries related to, 94:6.64

GYMNASIUM FIRES

University, Arizona, 1993, 94:5.30

H

HAGERSVILLE, ONT.

Tire fire, 1990, 91:1.50

HALIFAX, NOVA SCOTIA

Munitions ship explosion, Dec. 6, 1917, 92:3.96

HALONS

Alternative protection methods to replace halons, 94:6.40, 97:4.62

Extinguish aircraft fire, 92:6.76, 95:6.110

Extinguishing system fails in subway token booth fire, 96:6.24

Halon phaseout speeded up to Jan. 1, 1994, 93:2.38

Manually activated system not a factor in fire, 92:6.79

Museums and other applications, 92:5.66

Second International Conference, 1990, 91:1.65

Time line on control of, 1974-91, 91:1.67

Use continues despite available alternatives, 95:6.46

HANDICAPPED PERSONS. *See* DISABLED PERSONS

HAPPY LAND SOCIAL CLUB FIRE

Catastrophic, New York, March 25, 1990, 91:4.61

HARVEYS LAKE, PENNSYLVANIA

Board and care facility fire, May 14, 1997, analysis, 97:5.68

HATHAWAY, LEONARD R.

Profile of, 96:6.38

HAWAII

Apartment building fire, 1993, 94:2.28

Catastrophic fires

Dwelling, Oct. 15, 1997, 98:5.45

Observatory, Jan. 16, 1996, 97:5.52, 6.59

Department store/office building fire, July, 1993, 94:6.91

Fatal store fire, 1993, 94:3.30

Warehouse fire, 1989, 91:1.31

HAWKINS, JASPER STILLWELL

Profile of, 95:2.23

NFPA Journal
10 Year Index 1987-1997

HAZARDOUS MATERIALS. *See also* HAZ-MAT ISSUES COLUMNS

- Ammonia line bursts, poses toxic threat to fire fighters, 93:6.85
- Asbestos (*See* ASBESTOS)
- Asbestos from ducts collected by haz-mat team after fire, 97:6.22
- Chemical plant fire, factor in, 92:6.75, 80
- Classification and containment of hazardous materials, 96:2.30
- Copper sulfate runoff diked, pumped, 94:6.36
- Cost-effectiveness of regional hazardous materials response teams, 94:1.63
- Federal regulations cover intrastate shipments of agricultural chemicals, 98:5.25
- Fire service applies new training and management skills to incidents, 95:2.90
- Food plant fire, factor in, 92:6.80
- General warehouse fire, factor in, 98:6.88
- Hampered fire fighting, 91:6.75
- Hampered fire fighting, chemical laboratory fire, 92:3.33
- Hazardous waste incinerator fire, Arkansas, 1994, 95:6.38
- Heat transfer fluid (HTF) (thermal VP-1) in fire required precautions, 91:6.76
- Iron foundry fire, factor in, 97:6.50
- Isocyanate smoke requires area evacuation, 94:6.93
- Metal milling plant fire, factor in, 98:6.85
- Munition ship explosion, Halifax, Nova Scotia, Dec. 6, 1917, 92:3.96
- Placards can mislead responders, 93:2.74
- Plastics plant fire, factor in, 97:1.28
- Polychlorinated biphenols at generating plant fire, 94:6.92
- Pool and spa chemicals present hazard in warehouse stores, 98:1.50, 98:4.44
- Railroad collisions and fires, factor in, 98:6.91
- Regulatory reform poses dangers, 97:3.41
- Response capabilities, assessment of, 92:1.36
- Sodium exposure at metals processing plant fire, 94:6.63
- Software links first responders to databases, 97:3.66
- Sprinklers caused paint vats to overflow, 92:4.28
- Storage lockers for materials with flammable, combustible liquid characteristics, 94:5.71

HAZ-MAT ISSUES COLUMNS

- Balancing safety and international economic development, 94:4.19
- Carbon monoxide is top hazard, 95:5.23
- Chemical properties of hazardous substances critical to decision-making, 91:6.94
- Community hazards analysis to precede response team formation, 91:5.18
- Competency is key to responders' performance, 93:3.40
- Decontamination not taken seriously by fire fighters, 93:5.32
- Decontamination programs, development of, 93:6.16
- Differentiating emergencies from incidental releases, 94:2.18
- Emergency planning is six-part process, 93:1.22
- Environmental damage mitigation in incident response, 91:1.112
- EPA/National Response Teams report critiques federal agencies, 95:1.19
- Federal haz-mat response needs simplification, standardization, 95:3.27
- Federal legislation may affect responders, 94:6.20
- Hazardous Materials Transportation Uniform Safety Act of 1990 (USA 90), discussion, 91:3.117
- Isman, Warren, legacy to hazardous materials instruction, 92:2.22
- Lifesaving principles, 92:3.136
- Limitations of haz-mat equipment, 93:2.104
- Multigas detectors are required equipment, 95:6.25
- Networking most effective at local conferences, 94:1.16
- NFPA 472, 473, comments sought on, 91:2.110

NFPA Journal
10 Year Index 1987-1997

Technology, public opinion, and prevention must be considered by response teams, 94:3.17

Train responders to have a safe attitude, 92:6.89

Training programs' effectiveness questioned, 95:4.27

HEALTH CARE

Home health care increase fire, electrical, explosion risks, 98:1.64

HEALTH CARE FACILITIES

NFPA 99, *Health Care Facilities*, common questions answered, 96:6.28

HEALTH CARE FACILITIES FIRES. See also GROUP HOME FIRES; HOSPITAL FIRES; NURSING HOME FIRES

Clinic fires, California, 1995, 96:1.24

Fire safety prognosis for '90s, 92:3.89

New York, July 21, 1990, 91:6.78

Sprinklers prevent tragedy in two fires, 93:5.49

HEARING-IMPAIRED PERSONS

Fatal fire victim may not have heard smoke alarm, 93:2.22

HEART ATTACKS

Fire fighter fatalities related to, 98:4.57, 60

HEAT, CONDUCTIVE

Warehouse fire spread by, 91:1.31

HEAT DETECTORS. See DETECTORS, HEAT

HEATING-AND-COOKING EQUIPMENT. See also HVAC systems

Heating equipment, risks of, 96:6.128

HEATING-AND-COOKING EQUIPMENT FIRES

Broiler burners ignite grease, 97:4.22

Butane leaks from portable stove cylinder, ignites, 94:5.30

Catastrophic

Hydraulic oil ignited by natural gas burners, 92:1.29

Space heater ignites combustibles, 91:4.64

Wood stove as cause, 91:4.64, 68

Ceiling furnace malfunctions ignites wood ceiling, 93:6.83

Charcoal from grill ignites bag, 93:6.29

Charcoal grill, inside dwelling, ignites draperies, 94:4.32

Charcoal grill trash ignited by, 93:3.35

Charcoal grill unattended, ignites combustibles, 96:2.23

Commercial cooking operations, safety requirements, 97:1.33

Cooking food overheats, ignites, 93:1.27

Deep fat fryer fire ignites grease in hood and duct work, 94:3.28

Deep fat fryer overheats, ignites contents, 92:5.25

Electric heater cord, joined to extension cord, overheats, ignites living room contents, 94:5.96

Electric heater ignites bedding, 91:1.30

Electric heater ignites blanket, 94:5.98

Electric heater ignites clothing, 95:4.38

Electric heater ignites combustibles in catastrophic fire, 92:4.69

Electric heater ignites mattress, furniture, newspapers in catastrophic fire, 92:4.67

Electric heater overheats, ignites combustibles, 97:4.22

Electric heater possible cause of fatal fire, 92:6.28

Electric hot plate ignites pentane vapors in lab fire, 92:3.33

Electric hot plate ignites table in catastrophic fire, 92:4.68

Electric skillet, unattended, ignites trash, combustibles, 95:2.29

Electric space heater, and extension cord, create high-resistance arc, ignite combustibles, 98:5.46

Electric space heater ignites bedding/clothing in catastrophic fire, 95:5.53

NFPA Journal
10 Year Index 1987-1997

Electric space heater ignites furniture, 97:5.51
Electric space heater ignites hydraulic oil, 95:6.102
Electric space heater ignites love seat in catastrophic fire, 95:5.58
Electric space heater ignites upholstered materials, 97:2.22
Electric stove, unattended, ignites secondary fire, 93:5.64
Electric wall heater ignites cardboard box, 94:1.32
Electrical wall heater ignites wallboard, 91:1.28
Food placed in oven overheats, ignites, 96:6.22
Frying pan ignites in catastrophic fire, 91:4.66
Furnace overheats due to improperly installed limit switch, 95:6.99
Gas burner, used as heat source, ignites cabinets, 97:1.25
Gas burner ignites grease, food deposits, 92:3.34
Gas ceiling heater ignites cardboard, 95:6.100
Gas fryer pilot light ignites leaking natural gas, 92:6.25
Gas furnace ignites floor, 91:1.27
Gas furnace ignites rubbish in fatal apartment fire, 91:4.25
Gas heater, installed incorrectly, ignites roof, 93:6.84
Gas heater ignites gasoline vapors, 97:2.23
Gas heater ignites heat transfer fluid (HTF), 91:6.76
Gas heater ignites natural gas from ruptured piping, 94:1.30
Gas heater ignites paper, 93:5.36
Gas heater ignites paper dust, 91:6.75
Gas heater radiant heat ignites boxes, 97:6.57
Gas oven heat ignites wood structural members, 97:6.50
Gas oven vent pipe leaks heat, ignites combustibles, 97:6.53
Gas oven/broiler malfunctions, ignites kitchen wall, 97:5.52
Gas space heater ignites gasoline vapors, 97:1.26
Gas stove, operating unattended, ignites cabinets, 95:5.56
Gas stove heat ignites grease in exhaust system, 97:6.22
Gas stove pilot ignites leaking natural gas, 95:3.39
Gas stove pulled from wall fuels apartment fire, 91:3.26
Gas stove used for heating, catastrophic fire factor, 91:4.65
Gas wall heater malfunctions, ignites wood framing, 94:5.96
Gas water heater pilot light ignites gasoline vapors, 91:4.67
Gas water heater conductive heat ignites foam insulation, 98:2.18
Gas water heater ignites accumulated gas, 96:2.23
Gas water heater ignites gasoline vapors in fatal dwelling fire, 93:2.21
Gas water heater pilot ignites gasoline, catastrophic fire factor, 96:5.91
Gas water heater pilot light blown out, catastrophic fire factor, 93:5.68
Gas-fired boiler ruptures, severs gas line and ignites fire, 93:6.83
Gas-fired furnace heat ignites upholstered chair, 95:5.62
Gas-fired furnace ignites clothing, 95:5.54
Gas-fired heating unit ignites stored combustibles, 95:1.34
Grease in pan ignites, fire spreads to wood cabinets, 97:5.22
Grill ignites grease, food, 95:2.31
Grill ignites oil, grease in hood and duct, 96:5.25
Heat lamps ignite plastic trays, 96:3.36
Heat pump failed, 94:6.90
Heat trace cable ignites wood framing, 96:6.24
Heating season fire safety tips, 98:6.120
Hot plate probable cause of recreational facility fire, 93:6.88
Infrared heater ignites natural gas leak, 96:6.65
Kerosene heater, factor in catastrophic fire, 97:5.50
Kerosene heater fuel spills, ignites carpet, 98:6.23

NFPA Journal
10 Year Index 1987-1997

Kerosene heater ignites combustibles, 95:1.34
Kerosene heater ignites wood paneling, 98:5.45
Kerosene heater possibly refueled with alcohol, fails, ignites fatal fire, 98:2.16
Kerosene heater tips over, ignites combustibles, catastrophic fire factor, 97:5.49
Kerosene heater using gasoline ignites bedding, 92:2.28
Kitchen fire statistics, fire safety information, 98:1.88
LP-Gas grill tank, improperly installed, leaks, ignites restaurant fire, 98:3.36
LP-Gas regulator malfunctions, causes heater explosion/fire, 97:5.49
LP-Gas stove flame ignites clothing of disabled, elderly person, 98:2.16
Microwave oven malfunctions, ignites fire, 96:3.36
Natural gas appliance pilot lights surge, ignite manufactured homes fire, 96:3.36
Natural gas heater, 94:6.64
Natural gas heater, under repair, leaks gas, 95:1.33
Natural gas water heater ignites stored combustibles, 95:5.60
Natural gas water heater pilot ignites lacquer thinner vapors, 94:5.104
Natural gas water heater possible catastrophic fire cause, 95:5.62
Oil furnace malfunctions, fire spreads through chimney, 97:6.57
Oil-fired furnace vent ignites structural members, 95:5.54
Oil-fired hot air heating unit, installed incorrectly, ignites wood structure, 94:1.29
Pot, unattended, melts, ignites wood cabinets, 95:5.53
Pot, unattended, melts, radiant heat ignites hood filter, wooden cabinets, 97:5.51
Pot, unattended, overheats, causes grease to ignite, 95:5.62
Pot, unattended, overheats, ignites catastrophic fire, 93:5.62
Pot, unattended, overheats, ignites catastrophic fires, 94:5.96, 98
Pot, unattended, overheats, ignites cooking oil, 96:6.22
Pot, unattended, overheats, ignites fatal fire, 95:5.34
Pot, unattended, overheats, ignites grease, 97:1.25
Pot, unattended, overheats, ignites oil, 98:5.15, 6.23
Pot, unattended, overheats, ignites oil, catastrophic fire, 98:5.49
Pot, unattended, overheats oil, 96:1.22
Pot, unattended, overheats oil which ignites in catastrophic fire, 95:5.58
Propane from grill tank released, contributes to fire spread, 96:4.22
Propane from grill tank released, ignited by spark, 94:3.28
Propane fuel in barbecue grill ignited by open flame, 91:5.26
Propane heater, portable, ignites paper, 95:6.35
Propane heater ignites explosion and fire, 91:3.27
Propane heaters ignite wood sprinkler enclosures, 95:1.32
Propane stove fuel contributes to fire spread, 94:5.96
Space heater ignites chair, possible fatal fire cause, 91:5.26
Space heater ignites combustible liquids in catastrophic fire, 92:4.71
Space heater ignites combustibles, 96:2.24, 96:6.21
Space heater ignites combustibles in catastrophic fire, 92:4.68
Space heater ignites furniture, 97:5.51
Space heater ignites gas in catastrophic fire, 91:4.66
Space heater ignites gasoline vapors, 97:1.26
Space heater ignites lantern fuel, 94:3.28
Space heater ignites structural components, 95:6.108
Space heater ignites upholstered materials, 97:2.22
Space heater used to ignite wood by child in fatal fire, 98:1.23
Stove burner ignites clothing, 94:2.29
Stove burners ignite book placed on stove, 94:5.27
Toaster oven cord ignites wood framing in catastrophic fire, 92:4.67
Toaster oven short circuits, ignites bread wrappings, paneling, 98:3.38
Wood stove, improperly installed, ignites wood paneling, 98:5.50

NFPA Journal
10 Year Index 1987-1997

Wood stove, radiant heat from flue ignites stored wood, 92:5.25
Wood stove chimney, improperly installed, ignites paneling and supports, 94:5.27
Wood stove ignites structural framing, catastrophic fire factor, 97:5.49
Wood stove near fire origin point, 95:5.58
Wood stove near source of fire origin, 98:5.46
Wood stoves, catastrophic fires caused by, 91:4.64,

HEWITT, TERRY-DAWN

Profile of, 98:2.32

HIGH-RISE BUILDINGS

Active fire protection required for high-rises, 96:6.34
Fire protection systems for high-rises, 94:2.36
Fire safety design, 93:6.4
Life safety codes and standards for, 92:1.12
NFPA codes and standards address fire risk concerns, 97:6.84
NFPA codes and standards useful worldwide, 96:2.36
Simulated plane crash into high-rise tests emergency preparedness, 93:6.35

HIGH-RISE BUILDING FIRES

Apartment buildings

Florida, 1990, 91:3.25
Florida, 1993, 94:5.27
New York, 1993, 94:5.27
Virginia, 1992, 93:3.35

Catastrophic

Office building, Pennsylvania, Feb. 23, 1991, 92:4.71
Office building complex, New York, Feb. 26, 1993, 94:5.104, 94:6.90
Club/hotel, Indianapolis, Ind., Feb. 3, 1992, 92:6.31
Condominium, Illinois, 1990, 91:6.23
Department store/offices, Hawaii, July, 1993, 94:6.91
Dormitory, Arizona, 1990, 91:2.29
Fire protection needs revealed by recent fires, 92:5.56
Louisville, Ky., Fire Department training program, 94:2.55

Office buildings

California, March, 1991, 92:6.78
Iowa, 1992, 93:1.26
Los Angeles, Calif., Feb. 15, 1992, 92:5.56
Los Angeles, Calif., May 4, 1988, 92:5.56
Massachusetts, 1991, 92:5.28
New York, 1996, 97:6.22
Pennsylvania, Feb., 1991, 92:6.74
Philadelphia, Pa., Feb. 23, 1991, 91:5.64, 92:5.56
Utah, 1990, 91:2.30
U. S. high rise fires; systematic tracking system, 94:2.47
World Trade Center, N. Y., evacuation behavior, 95:2.59

HIGH-TECH INDUSTRIES

Fire protection for, 92:2.32

HISTORIC BUILDING FIRES. See also MANSION FIRES

California, 1996, 97:3.29
Massachusetts, 1994, 95:4.39
U. S. Treasury Building fire indicated life safety deficiencies, 96:6.52
West Virginia, 1996, 97:6.22

HOEBEL, JAMES F.

Profile of, 97:2.37

HOME FIRES. See DWELLING FIRES; RESIDENTIAL FIRES

HOMELESS. See also VAGRANTS

NFPA Journal
10 Year Index 1987-1997

Catastrophic fires involving, 91:4.67
Catastrophic wharf fire victims, 98:5.53
Fatal truck fire, Massachusetts, 1996, 97:5.24

HOODS, KITCHEN VENTILATION

Blocks sprinklers from deep fat fryer fire, 92:5.25
Dry chemical extinguishing system operates, but fire above system, 97:6.53
Grill fire ignites grease prior to suppression system activation, 96:5.25
Sprinkler in hood extinguishes fire, 92:6.25

HOSPITAL FIRES

Catastrophic
New York, Sept. 1, 1993, 94:5.105
Virginia, Dec. 31, 1995, 95:5.64
Illinois, 1994, 95:1.31
Illinois, 1997, 98:1.24
Massachusetts, Jan. 24, 1993, 93:5.49
Massachusetts, 1995, 96:5.26
Massachusetts, Oct. 16, 1996, analysis, 97:3.88
Missouri, 1997, 98:5.17
Ohio, 1994, 95:2.31
Ontario, Canada, 1992, 93:2.20
Pennsylvania, 1991, 92:2.27
Tennessee, 1991, 92:5.25

HOT SEAT COLUMNS. See PROFILE COLUMNS

HOT TUBS

National Electrical Code prevents accidents, 92:4.22

HOTEL FIRES. See also RESORT FIRES

Alaska, March 20, 1996, 97:6.57
California, 1990, 91:6.24
California, 1993, 94:2.28
Catastrophic
Florida, April 6, 1990, 91:4.64
Illinois, March 16, 1993, 94:5.95
Minnesota, July 12, 1991, 92:4.67
Favorable hotel fire safety trends lead to change in reporting protocol, 96:4.55
Florida, 1993, 94:2.29
Florida, 1994, 95:2.29
Florida, 1997, 98:6.23
Illinois, March, 1992, 93:6.81
Indiana, 1992, 92:6.31
Maine, March, 1994, 95:6.108
MGM Grand Hotel fire, Nov. 21, 1980, 96:2.70
Michigan, 1991, 92:1.22
Michigan, 1994, 95:1.33
Michigan, 1997, 98:3.41
Mississippi, 1995, 96:5.24
Nevada, 1997, 98:5.16
New Jersey, 1993, 94:2.30
Ohio, 1996, 97:6.19
Texas, 1996, 97:4.19
Thailand, Royal Jomtien Hotel, July 11, 1997, fire investigation report, 98:2.34

HOUSEKEEPING, POOR

Kennel fire, factor in, 93:2.20
Printing plant fire, factor in, 93:4.27

HOUSING FOR ELDERLY FIRES

NFPA Journal
10 Year Index 1987-1997

California, 1995, 96:5.24
Illinois, 1993, 94:1.31
Kansas, 1990, 91:3.25
Massachusetts, 1992, 93:6.28
Missouri, 1989, 91:1.30

HVAC SYSTEMS

Electric fault in wiring ignites framing, 97:5.23
Fire spread through, 94:5.104
High-rise club/hotel fire, factor in, 92:6.31
Interlocks, automatically triggered by smoke in catastrophic fire, 97:5.52
Roof-mounted, fire spread to, 94:6.35
Smoke, combustion products in high-rise office building fire distributed by, 92:5.56
Sprinklers blocked by, 94:2.30
Supermarket fire, factor in, 91:2.30

HYDROGEN FIRES

Electrical arc ignites hydrogen, 91:3.31, 95:6.102
Friction when line ruptures ignites hydrogen, 94:6.36
Hydrogen from chemical reaction ignites, 94:6.95
Hydrogen generated by release of sulfuric acid, ignites, 93:4.27
LP-Gas burner ignites hydrogen, 92:5.28

HYDROGEN FIRES AND EXPLOSIONS

Pipe connection failed, 91:5.30
Power plant fire ignites hydrogen, 94:6.92, 95:6.100

I

IDAHO

Catastrophic fires
 Manufactured home, Sept. 27, 1997, 98:5.46
 Motor vehicle, July 4, 1997, 98:5.55
Dwelling fire, 1995, 96:4.22
Wildland fire, 93:4.26
Wildland/urban interface fire, 1996, 97:4.21

ILLINOIS

Apartment building fire, 1994, 95:4.37
Bus fire, 1991, 92:4.26
Catastrophic fires
 Aircraft, Oct. 30, 1996, 97:5.54
 Aircraft, Nov. 19, 1996, 97:5.54
 Apartment building, May 30, 1990, 91:4.65
 Apartment building, March 14, 1991, 92:4.69
 Apartment building, March 20, 1994, 95:5.53
 Apartment building, Sept. 15, 1997, 98:5.46
 Apartment building, Oct. 26, 1997, 98:5.46
 Apartment building fire, Dec. 9, 1991, 92:4.67
 Barge, July 3, 1997, 98:5.55
 Dwelling, Jan. 11, 1990, 91:4.65
 Dwelling, Jan. 1, 1991, 92:4.68
 Dwelling, Dec. 6, 1992, 93:5.64
 Dwelling, Aug. 14, 1994, 95:5.54
 Dwelling, Jan. 14, 1995, 96:5.91
 Dwelling, Aug. 12, 1995, 96:5.93
 Gas distribution main fire/explosion, Jan. 17, 1992, 93:5.68
 Hotel, March 16, 1993, 94:5.95
 Train, Dec. 22, 1995, 96:5.101
Church fire, 1989, 91:1.30

NFPA Journal
10 Year Index 1987-1997

- Club fire, 1994, 95:3.39
 - Coal mine fire, Sept., 1991, 92:6.77
 - Coal preparation plant fire, Dec., 1993, 94:6.93
 - Condominium fire, 1990, 91:6.23
 - Condominium fire, Nov. 17, 1996, 97:6.58
 - Dwelling fire, 1994, 95:6.36
 - Dwelling under construction, 1990, 91:3.27
 - Electric generating plant fire, Nov., 1994, 95:6.100
 - Electric generating plant fire, Dec. 18, 1996, 97:6.58
 - Fatal fires
 - Apartment building, 1990, 91:4.25
 - Apartment building, 1993, 94:1.31
 - Dwelling, 1997, 98:3.38
 - Group home, 1994, 95:6.37
 - Hospital, 1994, 95:1.31
 - Hospital fire, 1997, 98:1.24
 - Hotel fire, Jan., 1992, 93:6.81
 - Manufacturing plant fire, 1997, 98:4.20
 - Manufacturing plant fire, Sept., 1992, 93:6.83
 - Manufacturing plant fire, May, 1993, 94:6.94
 - Manufacturing plant fires, 1994, 95:2.32, 95:3.38
 - Manufacturing plant fire, March, 1994, 95:6.108
 - Manufacturing plant fire, Sept., 1994, 95:6.107
 - Manufacturing plant fire, Oct., 1995, 96:6.65
 - Manufacturing plant fire, Feb. 7, 1996, 97:6.52
 - Manufacturing plant fire, May 1, 1996, 97:6.50
 - Mill fire, Aug., 1993, 94:6.94
 - Mixed-occupancy fire, 1992, 93:3.34
 - Nuclear energy plant fire, April, 1994, 95:6.102
 - Nursing home fire, 1997, 98:1.24
 - Recreational facility fire, March, 1992, 93:6.88
 - Restaurant fire, 1991, 92:5.30
 - Restaurant/country club fire, Oct. 18, 1996, 97:6.59
 - Store fires, 1989, 91:1.29
 - Store fires, 1992, 93:3.34
 - Store fire, 1993, 94:1.32
 - Store fire, Apr. 24, 1996, 97:6.54
 - Store fire, Oct. 29, 1996, 97:6.53
 - Warehouse fire, Jan., 1993, 94:6.96
 - Warehouse fire, Aug., 1993, 94:6.96
 - Warehouse fire, 1994, 95:3.38
 - Warehouse fire, Oct. 29, 1996, 97:6.56
- IMPERIAL FOODS PROCESSING PLANT**
- Catastrophic, Sept. 3, 1991, 92:1.29
- IN COMPLIANCE COLUMNS**
- Building site plan needs exit discharge from exit to public way, 98:5.22
 - Development of performance-based provisions for *Life Safety Code*, 98:2.24
 - Exit access, exterior exits, and exit discharge must be clear of obstructions, 98:6.28
 - Fire protection, water supply industries discuss sprinkler backflow prevention, 97:6.26
 - NFPA 101B, *Means of Egress*, new document scheduled for 1998 NFPA Fall Meeting, 98:1.28
 - Office, store renovations can lead to code-compliance problems, 97:4.26
 - Protecting mixed occupancies, 97:3.38
 - School exits require balancing fire safety and security needs, 98:3.46

NFPA Journal
10 Year Index 1987-1997

- Users' manuals needed to document building fire protection systems, 98:4.26
Uses of, and alternatives to, occupancy classifications, 97:5.28
INCENDIARY (SUSPICIOUS) FIRES. *See also* JUVENILE FIRESETTING
Apartment building, California, Nov., 1993, 94:6.89
Apartment building, Colorado, 1997, 98:4.20
Apartment building, New York, 1993, 94:5.27
Apartment building, Ohio, 1996, 97:4.20
Apartment building, Texas, Jan. 16, 1997, 98:6.90
Apartment complex fire, New Mexico, July, 1995, 96:6.74
Arsonists use pyrotechnic accelerants in Washington fires, 92:6.67
Automotive parts warehouse, North Carolina, Aug. 12, 1997, 98:6.88
Building under renovation, California, 1991, 92:5.26
Catastrophic
Apartment building, California, Sept. 7, 1991, 92:4.69
Apartment building, California, May 3, 1993, 94:5.95
Apartment building, Illinois, Dec. 6, 1992, 93:5.64
Apartment building, Illinois, March 20, 1994, 95:5.53
Apartment building, Illinois, Sept. 15, 1997, 98:5.46
Apartment building, Minnesota, Feb. 28, 1994, 95:5.58
Apartment building, New York, Aug. 4, 1990, 91:4.66
Apartment building, New York, March 13, 1991, 92:4.67
Apartment building, North Carolina, Sept. 5, 1993, 94:5.100
Apartment building, Oregon, June 28, 1996, 97:5.49
Apartment building, Rhode Island, Feb. 27, 1993, 94:5.96
Automobile, Kentucky, Sept. 27, 1996, 97:5.55
Board and care facility, California, Oct. 3, 1995, 96:5.97
Board and care facility, Texas, Aug. 13, 1990, 91:4.68
Board and care facility, Texas, April 11, 1993, 94:5.105
Club fire, New York, March 25, 1990, 91:4.67
Dwelling, Alabama, Aug. 27, 1990, 91:4.64
Dwelling, Alabama, July 20, 1997, 98:5.50
Dwelling, California, 1992, 93:5.64
Dwelling, California, May 29, 1995, 96:5.91
Dwelling, California, April 26, 1997, 98:5.45
Dwelling, Illinois, May 30, 1990, 91:4.65
Dwelling, Illinois, Jan. 14, 1995, 96:5.91
Dwelling, Indiana, June 30, 1994, 95:5.60
Dwelling, Maryland, July 7, 1992, 93:5.62
Dwelling, Michigan, Feb. 28, 1990, 91:4.64
Dwelling, Michigan, Oct. 3, 1992, 93:5.62
Dwelling, Michigan, Nov. 30, 1993, 94:5.102
Dwelling, New Jersey, Feb. 13, 1992, 93:5.62
Dwelling, New York, June 28, 1994, 95:5.60
Dwelling, Ohio, Jan. 26, 1992, 93:5.62
Dwelling, Oklahoma, Sept. 21, 1993, 94:5.100
Dwelling, Pennsylvania, March 3, 1990, 91:4.64
Dwelling, Pennsylvania, July 30, 1990, 91:4.66
Dwelling, Pennsylvania, Dec. 23, 1994, 95:5.58
Dwelling, Pennsylvania, Oct. 24, 1997, 98:5.50
Dwelling, Tennessee, March 31, 1992, 93:5.62
Dwelling, Texas, Feb. 2, 1995, 96:5.92
Dwelling, Washington, Dec. 17, 1992, 93:5.66
Dwelling, West Virginia, Nov. 21, 1997, 98:5.50
High-rise building complex, New York, Feb. 26, 1993, 94:5.104, 94:6.90

NFPA Journal
10 Year Index 1987-1997

Hospital, Virginia, Dec. 31, 1994, 95:5.64
Hotel, Colorado, Jan. 27, 1997, 98:5.49
Manufacturing plant/warehouse, Washington, Jan. 5, 1995, 96:5.96
Multiple occupancy, New York, Jan. 16, 1990, 91:4.65
Office building, Oklahoma, Apr. 19, 1995, 96:1.50, 96:1.59, 96:5.94, 96:6.69
Store, New York, Dec. 8, 1995, 96:5.94
Store/apartment building, New York, Aug. 22, 1994, 95:5.66
Vacant store, California, Oct. 22, 1991, 92:4.71
Wildland/urban interface, California, Nov. 2, 1993, 94:5.108
Church, Massachusetts, 1992, 93:2.21
Church, Ohio, 1994, 95:3.39
Church, Pennsylvania, Feb., 1995, 96:6.73
Club, Florida, Jan., 1993, 94:6.91
Club/restaurant/office building, Oklahoma, Jan., 1994, 95:6.98
College building, Rhode Island, 1994, 95:3.37
Cotton warehouse, Missouri, Feb. 24, 1997, 98:6.88
Department store, North Carolina, 1997, 98:6.22
Department store, Texas, Sept., 1995, 96:6.72
Detention facility, California, 1992, 93:5.36
Detention facility, Delaware, 1990, 91:3.25
Detention facility, Florida, 1992, 93:3.33
Detention facility, North Carolina, 1996, 97:1.27
Detention facility, Pennsylvania, 1994, 95:5.33
Dormitory fire statistics, 97:3.152
Dumpster outside warehouse, Hawaii, 1989, 91:1.31
Dwelling, California, April, 1992, 93:6.79
Dwelling, Massachusetts, 1993, 94:6.34
Dwelling, New York, 1994, 95:4.37
Fire fighter fatalities related to, 95:4.87, 96:4.66, 70, 97:4.51
Fire fighter injuries related to, 97:6.74
Government building, Massachusetts, 1991, 92:6.26
Health clinics, California, 1995, 96:1.24
Hospital, Illinois, 1994, 95:1.31
Hospital, Ohio, 1994, 95:2.31
Hotel, Florida, 1994, 95:2.29
Hotel, Michigan, 1991, 92:1.22
Hotels, Michigan, 1997, 98:3.41
Hotel, Texas, 1996, 97:4.19
Industrial complex, Michigan, April, 1994, 95:6.108
Kennel, Massachusetts, 1992, 93:2.20
Library, California, Jan., 1992, 93:6.79
Library, Connecticut, 1996, 97:1.26
Manufactured home, Colorado, 1997, 98:1.23
Manufactured home, Florida, 1990, 91:5.28
Manufacturing plant, Arkansas, July, 1994, 95:6.104
Manufacturing plant, Arkansas, Dec., 1994, 95:6.106
Manufacturing plant, California, 1997, 98:2.20
Manufacturing plant, California, April, 1994, 95:6.107
Manufacturing plant, Georgia, March, 1994, 95:6.106
Manufacturing plant, Indiana, Oct., 1994, 95:6.104
Manufacturing plant, Indiana, Dec. 24, 1997, 98:6.84
Manufacturing plant, Iowa, March 23, 1996, 97:6.52
Manufacturing plant, Maine, 1994, 95:5.34
Manufacturing plant, Massachusetts, Jan., 1992, 93:6.84

NFPA Journal
10 Year Index 1987-1997

Manufacturing plant, Michigan, Aug., 1991, 92:6.78
Manufacturing plant, Michigan, Jan., 1993, 94:6.95
Manufacturing plant, Michigan, June, 1993, 94:6.93
Manufacturing plant, New Mexico, March, 1992, 93:6.85
Manufacturing plant, New York, Aug., 1995, 96:6.65
Manufacturing plant, North Carolina, May, 1992, 93:6.84
Manufacturing plant, North Carolina, 1994, 95:2.32
Manufacturing plant, North Carolina, Oct., 1994, 95:6.103
Manufacturing plant, Ohio, Oct., 1994, 95:6.104
Manufacturing plant, Pennsylvania, June, 1991, 92:6.80
Manufacturing plant, Utah, Feb. 1, 1997, 98:6.86
Medical center complex, New York, 1990, 91:6.7
Mill fire, Connecticut, 1995, 96:2.25
Motion picture studio/manufacturing complex, California, Nov. t, 1990, 91:6.74
Multiple-use occupancy, Massachusetts, 1991, 92:1.23
Multiple-use occupancies, Illinois, 1992, 93:3.34
Nursing home, Utah, 1991, 92:4.27
Office building, California, 1993, 94:5.30
Office building, California, 1995, 96:1.21
Office building, Denver, Colo., Sept. 28, 1992, 93:2.33
Office building, Washington, 1993, 94:2.29
Office building/warehouse, Texas, Oct., 1994, 95:6.99
Office/apartment building, New York, Aug., 1994, 95:6.100
Our Lady of the Angels school, Chicago, IL, 1958, 96:1.72
Restaurant, Illinois, 1991, 92:5.30
Restaurant, Massachusetts, 1996, 97:5.22
Restaurant, Virginia, 1996, 97:2.21
Retail warehouse store, Arizona, March 21, 1998, 98:4.49
Rooming house, Massachusetts, 1996, 97:1.26
School, Florida, 1993, 94:1.29
School, Indiana, Dec., 1994, 95:6.98
School, Minnesota, April, 1994, 95:6.98
School, Mississippi, 1990, 91:3.27
School, Nova Scotia, Canada, 1991, 92:5.30
School, Oregon, 1991, 92:2.25
School, Rhode Island, March, 1992, 93:6.79
Shopping mall, Nevada, 1992, 93:2.19
Shopping mall, New York, May, 1991, 92:6.77
Storage building, Massachusetts, 1996, 97:2.23
Storage facility, Massachusetts, 1993, 94:2.27
Storage facility, New Hampshire, Jan. 8, 1996, 97:6.56
Storage facility, Texas, June/July, 1995, 96:6.66
Store, California, 1992, 93:5.38
Store, California, 1996, 97:1.27
Store, Florida, 1993, 94:5.30
Store, Illinois, 1989, 91:1.29
Store, Massachusetts, 1989, 91:1.28
Store, Massachusetts, 1994, 95:4.39, 95:5.36
Store, Michigan, 1991, 92:6.25
Store, Mississippi, 1993, 94:1.32
Store, Ohio, Nov. 13, 1996, 97:6.54
Subway token booth, New York, 1995, 96:6.24
Tire fire, Ontario, Canada, 1990, 91:1.50
U. S. arson statistics: fire damage and firesetters, 95:2.112

NFPA Journal
10 Year Index 1987-1997

- U. S. arson statistics: types of fires and firesetters, 98:6.39
 - U. S. national reporting systems for fire investigations, 98:3.80
 - Warehouse, Colorado, Nov., 1992, 93:6.87
 - Warehouse, Georgia, May, 1992, 93:6.86
 - Warehouse, Illinois, 1994, 95:3.38
 - Warehouse, Indiana, July, 1993, 94:6.96
 - Warehouse, Louisiana, March 21, 1996, 97:6.54
 - Warehouse, Massachusetts, Nov., 1993, 94:6.97
 - Warehouse, Michigan, 1995, 96:3.39
 - Warehouse, Missouri, 1991, 92:6.26
 - Warehouse, Pennsylvania, Aug. 27, 1996, 97:6.56
 - Warehouse, Rhode Island, May, 1992, 93:6.86
 - Warehouse, Washington, Sept., 1992, 93:6.86
 - Warehouse/office building, California, 1991, 92:1.23
 - Wildland, California, Aug., 1992, 93:6.88
 - Wildland, California, Oct., 1993, 94:6.99
 - Wildland, California, Nov., 1993, 94:6.99
 - Wildland/urban interface, Calif., Aug., 1994, 95:6.111
 - Wildland/urban interface, California, June 27, 1990, 91:1.60, 61, 91:6.73, 75
 - Wildland/urban interface, California, Oct., 1991, 92:6.74
 - Wildland/urban interface, New York, Aug., 1995, 96:6.74
- INCENSE
- Fatal dwelling fire caused by, 98:4.19
- INCINERATOR FIRES
- Arkansas, 1994, 95:6.38
- INDIANA
- Catastrophic fires
 - Bulk storage elevator fire, Oct. 1, 1996, 97:5.52
 - Dwelling, June 30, 1994, 95:5.60
 - Dwelling, Aug. 9, 1994, 95:5.56
 - Dwelling, Dec. 4, 1995, 96:5.93
 - Electric generating plant, Oct. 5, 1992, 93:5.67
 - Manufacturing plant, June 22, 1995, 96:5.97
 - Restaurant/hotel, Feb. 6, 1992, 93:5.66
 - Truck, March 20, 1993, 94:5.106
 - Church fire, 1993, 94:4.31
 - Church fire, Sept., 1993, 94:6.89
 - College building fire, 1994, 95:5.35
 - Dwelling fire, 1993, 94:1.30
 - Fatal high-rise club/hotel fire, Feb. 5, 1992, 92:6.31
 - Manufacturing plant fires, June, 1994, 95:6.103
 - Manufacturing plant fire, July, 1994, 95:6.102
 - Manufacturing plant fire, Oct., 1994, 95:6.104
 - Manufacturing plant fire, Dec. 24, 1997, 98:6.84
 - Manufacturing plant fire, May, 1995, 96:6.65
 - Manufacturing plant fire, Aug., 1995, 96:6.65
 - Manufacturing plant fire, March 19, 1996, 97:6.50
 - Office building fire, July 16, 1996, 97:6.53
 - Restaurant fire, 1995, 96:5.25
 - School fire, Dec., 1994, 95:6.98
 - Warehouse fire, April, 1992, 93:6.87
 - Warehouse fire, July, 1993, 94:6.96
 - Warehouse fire, March 18, 1997, 98:6.88
 - Warehouse fire, Oct. 8, 1996, 97:6.57

NFPA Journal
10 Year Index 1987-1997

INDIANAPOLIS, IND.

Fatal high-rise club/hotel fire, Feb. 5, 1992, 92:6.31

INDUSTRIAL MACHINERY FIRES

Air dryer motor malfunctions, ignites wiring, insulation, 97:1.28

Air-compressor ignites lubricating oil, 92:6.79

Bearing box overheats on conveyor belt, ignites chaff and dust, 93:6.83

Book binding machine overheats, ignites glue, 93:4.27

Conveyor failure causes sugar dust to ignite, 97:6.49

Drying machine overheats, ignites pet food, 94:3.29

Electroforming tank heater overheats, ignites tank contents, 97:4.22

Forging equipment heat ignites cardboard, 97:6.52

Form machine malfunctions, ignites acrylic sheet, 97:4.22

Gas compressor, 98:6.85

Grinding wheel sparks ignite wooden studs, 98:1.24

Hydrocracker unit pipe ruptures, causes explosion/fire, 98:6.84

Leaking oil ignited by furnace, 97:6.49

Packaging machine malfunctions, ignites combustible materials, 93:6.29

Paper ignited by jammed molding machine, sucked into waste disposal system, 97:5.24

Poloyol pump malfunctions, causes exothermic reaction, 98:3.41

Production equipment malfunctions, ignites combustibles, 95:6.107

Pulverizing unit explosion, followed by fire, 97:6.58

Sawdust in motor above veneer dryer ignites, 97:6.49

Waste-handling machine overheats, ignites fiber residue, 92:5.30

Waxing machine, fire started in combustibles near, 98:6.86

INDUSTRIAL OCCUPANCIES. See also MANUFACTURING PLANT FIRES

Causes of fires in, 94:4.40

NFPA 101, *Life Safety Code*, applied to, 94:4.16

NFPA 101, *Life Safety Code*, is key to fire safety, 94:4.36

INJURIES. See FIRE INJURIES

INSIDE THE BELTWAY COLUMNS

Congress considers natural disaster relief policy reform, 97:5.31

Congressional Fire Services Institute (CFSI) makes fire services/safety visible to

Congress, 98:1.31

Dangers of regulatory reform, 97:3.41

Federal Communications Commission provides emergency radio frequencies, establishes
311 number, 97:4.29

Federal haz-mat regulations cover intrastate shipments of agricultural chemicals, 98:5.25

Federal program trains first responders for terrorist attacks, 98:6.31

Politics of fire safety regulations, 98:4.29

Technology Transfer Act helps, but not all federal regulatory references to standards
updated, 97:6.29

U. S. Consumer Products Safety Commission addresses fire safety issues, 98:3.49

Volunteer Protection Act of 1997 protects volunteers from liability, 98:2.27

INSPECTIONS

Electrical inspections threatened by budget cutbacks, 96:6.80

INSTITUTIONAL OCCUPANCIES. See separately listed occupancies

INSULATION

Cellulose

Fire, ignited by, 98:6.86

Welding, ignited by, 95:2.32

Wiring, ignited by, 94:4.29

Excelsior, ignited by cutting torch filings, 97:2.23

Exposed, contributed to fire spread, 97:6.56, 57, 59

Fiber board, ignited by welding, 94:6.94

NFPA Journal
10 Year Index 1987-1997

Fiberglass, factor in fire spread, 93:6.86

Foam

Conductive heat from water heater, ignited by, 98:2.18

Cutting torch, ignited by, 98:6.84

Factor in fire spread, 93:6.85, 86, 95:6.107, 97:5.52, 6.56, 59

Polyurethane, factor in fire spread, 95:6.107

Polyurethane, fueled fire, 91:6.75

Polyurethane, ignited by welding, 96:6.68

Polyurethane, in freezer, ignited by welding fire, 98:6.84

Styrofoam, ignited by welding, 94:6.93

Urethane, ignited by short-circuit, 94:3.27

Welding, ignited by, 94:6.93, 95:6.106, 96:6.68, 98:4.21

Foil-faced, carries ground to roof, ignites framing, 95:5.35

Oil-soaked, ignites, 94:6.92

Paper-backed, ignited by heat of fire, 97:6.19

Pipe, ignited by open-flame torch, 91:6.23

Plastic, ignited by electric box malfunction, 96:3.40

Rigid plastic, ignited in incendiary fire, 95:6.104

Vinyl-backed, factor in fire spread, 97:3.33

INSURANCE

Citizens should be liable for fire-causing actions, 95:4.38

INTERAGENCY RESPONSE

Tire fire, Canada, 91:1.60

INTERIOR FINISHES

Factors affecting fire hazards of, 92:4.33

Fuel catastrophic fires, 92:4.67, 69, 93:5.62, 64, 94:5.95, 96, 98, 102, 105

Fuels board and care facility fire, 93:1.29

Wall paneling fuels catastrophic fires, 95:5.60, 96:5.93

Wood paneling fuels club/hotel fire, 92:6.31

INTERNET

Fire protection information, access to, 96:6.44

INTOXICATION. *See* ALCOHOL (BEVERAGE)

IOWA

Catastrophic fires

Automobile, Nov. 23, 1994, 95:5.68

Dwelling, March 24, 1994, 95:5.54

Dwelling, Dec. 9, 1995, 96:5.93

Manufacturing plant, Dec. 13, 1994, 95:5.66

Restaurant, Oct. 17, 1994, 95:5.62

Dwelling fire, 1991, 92:4.26

Dwelling fire, 1992, 93:3.35

Fatal fires

Dwelling, 1991, 92:1.22

Foundry, 1989, 91:1.31

Tank explosion, April 9, 1998, fire investigation report, 98:6.42

High-rise office building fire, 1992, 93:1.26

Manufacturing plant fire, Feb., 1995, 96:6.63

Manufacturing plant fire, 1996, 97:1.28

Manufacturing plant fire, March 23, 1996, 97:6.52

Manufacturing plant fire, March 30, 1996, 97:6.49

Warehouse fire, 1997, 98:1.25

Warehouse fire, Feb., 1995, 96:6.68

Warehouse fire, April 22, 1997, 98:6.87

Warehouse fire, April, 1995, 96:6.66

NFPA Journal
10 Year Index 1987-1997

IROQUOIS THEATRE FIRE, CHICAGO, ILL.

E. Foy's first person account, 95:4.75

IRVING, TEXAS

Stadium fire, October 13, 1993, 94:4.49

ISMAN, WARREN

Legacy to hazardous materials instruction, 92:2.22

J

JAPAN

Earthquake and subsequent fire, July 12, 1993, 94:3.89

Fire service technology used by, 91:5.51

Tokyo fire service pioneers robot use, 92:2.67

JAVERI, SULTAN M.

Profile of, 97:3.48

JUST ASK COLUMNS

Airport gate area requirements, questions answered, 98:4.24

Alarm system installation questions answered, 97:4.25

Carbon monoxide questions answered, 98:5.20

Extinguisher questions answered, 97:2.29

Fireworks questions answered, 98:3.44

National Electrical Code questions answered, 97:6.25

NFPA 1, *Fire Prevention Code*, questions answered, 98:2.22

Private fire service main installation, 97:3.37

Safe commercial cooking operations, 97:1.33

Smoke detector questions answered, 98:6.26

Sprinkler system installation, 97:5.27

Sprinkler system requirements to be consolidated in NFPA 13, 98:1.26

JUVENILE FIRESETTING

Catastrophic apartment building fire cause, 92:4.67

Church fire cause, 1994, 95:3.39

Club/restaurant/office building fire cause, 95:6.98

Condominium fire cause, 91:6.24

Detention facility fire cause, 91:3.25, 95:5.33

Dwelling fire cause, 95:4.37

Fatal manufactured home fire cause, 91:3.25

Major cause of U. S. arson fires, 95:2.112

Manufacturing plant fire cause, 97:6.52

Mill complex fire cause, 94:6.98

NFPA Champion Award Program discourages firesetting, 97:2.34

Phoenix, Ariz., program, 91:1.22

School fire cause, 92:5.30

School fire caused by fireworks prank, 92:4.27

Social services needed by troubled children, 95:3.23

Storage building fire cause, 97:2.23

Store fire cause, 93:2.19, 94:1.32, 96:6.72, 97:1.27

Store/apartment building fire cause, 95:5.66

K

KADER INDUSTRIAL CO. (THAILAND) FIRE

Investigative report, 94:1.42

KANSAS

Aircraft hangar fire, July, 1993, 94:6.96

Catastrophic fires

Aircraft, Apr. 19, 1995, 96:5.100

Electric power generating plant, Nov. 24, 1997, 98:5.54

Truck, Dec. 22, 1997, 98:5.56

NFPA Journal
10 Year Index 1987-1997

College building fire, June, 1991, 92:6.78

Fatal fires

Housing for elderly, 1990, 91:3.25

Limited-care facility, 1997, 98:4.21

Manufacturing plant, 1989, 91:5.30

Vehicle, 1994, 95:2.31

Manufactured homes fire, 1995, 96:3.36

Railroad rolling stock fire, July 2, 1997, 98:6.91

Warehouse fire, 1994, 95:4.39

Wildland fire, Feb. 21, 1996, 97:6.59

KANSAS CITY, MISSOURI

SubTropolis underground storage/manufacturing facility, requires unique fire protection measures, 98:6.68

KEIGHER, DONALD J.

Profile of, 95:5.27

KENNEL FIRES

Massachusetts, 1992, 93:2.20

KENTUCKY

Beverly Hills Supper Club fire, May 28, 1977, 96:2.63

Boat fire, 1997, 98:3.42

Catastrophic fires

Apartment building, Sept. 12, 1997, 98:5.46

Automobile, Aug. 6, 1996, 97:5.54

Automobile, Sept. 27, 1996, 97:5.55

Coal mine, July 31, 1990, 91:4.69

Dwelling, Nov. 9, 1996, 97:5.51

Manufactured home, Sept. 30, 1994, 95:5.60

Storage tank, July 2, 1993, 94:5.104

College building fire, 1994, 95:5.35

Fatal fires

Dwelling, 1990, 91:5.26

Dwelling, 1997, 98:4.19

Manufactured home, 1993, 94:4.32, 94:5.27

Manufacturing plant fire, Feb., 1994, 95:6.106

Storage facilities fire, Nov. 7, 1996, 97:6.57

KILN FIRES

Natural gas pipeline to kiln fails, gas ignited by pilot flame, 97:6.52

Paper ignited by kiln in school fire, 97:3.34

KUNG, HSIANG-CHENG

Profile of, 95:4.31

L

LABAUVE, LAMAR

Profile of, 96:1.37

LABORATORY FIRES

California, 1990, 91:5.30

Michigan, 1991, 92:3.33

New York, 1995, 96:3.40

Ontario, Canada, 1992, 93:6.27

Pennsylvania, 1991, 92:4.25

Texas, 1991, 92:5.28

Texas, 1996, 97:5.23

LANTERNS

Propane lantern, without glass, ignites combustibles, 95:5.36

LARGE VOLUME SPACES

NFPA Journal
10 Year Index 1987-1997

- Fire spread factor, 95:6.98
- LARGE-LOSS FIRES, U. S.
 - 1990, study of, 91:6.28
 - 1991, study of, 92:6.40
 - 1992, study of, 93:6.73
 - 1993, study of, 94:6.84
 - 1994, study of, 95:6.94
 - 1995, study of, 96:6.58
 - 1996, study of, 97:6.44
 - 1997, study of, 98:6.80
 - History of study, 95:5.87
- LARGE-LOSS-OF-LIFE FIRES
 - China (toy manufacturing plant), Nov. 19, 1993, 94:1.48
 - General Slocum* excursion steamer, N. Y., N. Y., 1904, 95:4.80
 - Iroquois Theatre fire, Chicago, Ill., 1903, 95:4.75
 - New York (club), March 25, 1990, 91:4.67
 - North Carolina (food plant), Sept. 3, 1991, 92:1.29
 - Ohio State Penitentiary, April 21, 1930, 95:5.84
 - S. S. Noronic cruise ship, Toronto, Canada, Sept. 17, 1949, 97:1.58
 - Texas (manufacturing plant), July 5, 1990, 91:4.67
 - Thailand (toy manufacturing plant), May 10, 1993, 94:1.42
- LAS VEGAS, NEVADA
 - MGM Grand Hotel fire, Nov. 21, 1980, 96:2.70
 - Stratosphere Tower design uses performance and prescriptive codes, 97:3.72
- LEADERSHIP COLUMNS
 - Advice to aid transition of new fire chief, 97:5.32
 - Customer service as fire service priority, 98:1.32
 - Empowerment of fire service employees requires clear communications, 98:3.50
 - Fire fighters work with youth through Big Brothers/Big Sisters program, 98:2.28
 - Fire service participation in technical research can aid fire safety, 97:4.30
 - Future leaders should take responsibility for reaching their goals, 97:6.30
 - Leadership means taking a stand even on controversial issues, 98:5.26
 - Risk Watch* as safety education tool in effort to mitigate nonfire incidents, 98:6.32
 - Spanish-language versions of Learn Not to Burn Curriculum for Hispanic/Latino populations, 98:4.30
 - Without regulatory authority, alternative methods can influence fire safety, 97:2.33
 - Working relationships between fire chiefs and city managers, 97:1.37
 - Worldwide, fire service leaders can learn from each other, 97:3.42
- LEAVENWORTH, WASH.
 - Wildland fire, 1994, 95:2.48
- LIBRARY FIRES
 - California, Jan., 1992, 93:6.79
 - Connecticut, 1996, 97:1.26
- LIFE SAFETY CODE
 - 1991 edition, changes in, 91:3.33
 - 1991 edition, contents and furnishing regulations, 91:4.20
 - 1991 edition, overview, 91:5.61
 - Airport security measures jeopardize life safety, 96:6.85
 - Americans with Disabilities Act spurs code changes, 42, 93:3.18, 94:2.34
 - Application to industrial occupancies, 94:4.16
 - Board and care facility protection requirements questioned, 97:5.68
 - Building security provisions, 92:5.22
 - Building site plan needs exit discharge from exit to public way, 98:5.22
 - Development of performance-based provisions by NFPA, 98:2.24

NFPA Journal
10 Year Index 1987-1997

Evaluating equivalencies and exceptions, 95:1.16
Existing regulations, use of code with, 96:3.97
High-rise buildings, standards for, 92:1.12
History of, 92:3.42, 95:5.82
Industrial fire safety depends on code compliance, 94:4.36
New code has user-friendly language, conforms with Americans with Disabilities Act,
94:2.34
NFPA 101B, *Means of Egress*, new document scheduled for 1998 NFPA Fall Meeting,
98:1.28
Occupational Safety and Health Administration (OSHA) egress standards compared,
93:5.45
Overview of, 92:3.42
U. S. Treasury Building fire indicated life safety deficiencies, 96:6.52

LIFE SAFETY SYSTEMS

Microprocessor-controlled system installed at Winterthur Museum, 92:5.63

LIGHTNING

Church fire cause, 94:6.89, 95:6.98
Dwelling fire cause, 96:4.21
Educational facility fire cause, 92:6.78
Historic mansion fire cause, 94:4.31
Warehouse fire cause, 98:6.88
Wildland fire cause, 91:1.60, 61, 62, 91:4.70, 91:6.78, 93:3.36, 95:5.67
Wildland/urban interface fire cause, 95:6.111

LIMITED CARE FACILITY FIRES

Catastrophic, Ohio, Dec. 5, 1990, 91:4.69
Kansas, 1997, 98:4.21

LINGENFELTER, GERALD

Profile of, 96:2.39

LINT

Carpet manufacturing plant fire, factor in, 97:3.33
Hosiery manufacturing plant fire, factor in, 97:3.33
Textile manufacturing plant fire, factor in, 95:6.107

LION, DOUGLAS R.

Profile of, 93:2.16

LIQUEFIED NATURAL GAS

Vehicles fueled by, handling incidents involving, 94:4.84

LOCK BOXES

Value in commercial building fires, 91:1.29

LODGING HOUSE FIRES. See ROOMING HOUSE FIRES

LONG, MARIAN H.

Profile of, 96:6.39

LOPES, ROCKY

Profile of, 95:1.22

LOS ANGELES, CALIF.

Disaster response plan of fire department, 91:6.60
Fatal high-rise office building fire, May 4, 1988, 92:5.56
High-rise office building fire, Feb. 15, 1992, 92:5.56
New state-of-the art fire department dispatch center, 94:2.66
Urban search and rescue program meets diverse demands, 95:6.55

LOUISIANA

Catastrophic fires
Apartment building, Aug. 10, 1994, 95:5.60
Boat, Oct. 30, 1990, 91:4.70
Drilling platform, Feb. 15, 1991, 92:4.71

NFPA Journal
10 Year Index 1987-1997

- Dwelling, Nov. 16, 1991, 92:4.68
- Dwelling, Oct. 9, 1997, 98:5.50
- Manufactured home, April 10, 1999, 91:4.65
- Manufacturing plant, May 1, 1991, 92:4.70
- Oil and natural gas drilling well, June 16, 1997, 98:5.53, 6.91
- Refinery, March 3, 1991, 92:4.70, 92:6.77
- Refinery, Aug. 2, 1993, 94:5.105, 94:6.93
- Storage tank, March 11, 1990, 91:4.68
- Storage tank, Aug. 17, 1990, 91:4.68
- Fatal apartment fire, 1997, 98:2.16
- Manufacturing plant fire, April 15, 1997, 98:6.84
- Manufacturing plant fire, July, 1992, 93:6.83
- Manufacturing plant fire, May, 1991, 92:6.75
- Race track fire, Dec., 1993, 94:6.89
- Sawmill fire, 1993, 94:5.29
- Warehouse fire, March 21, 1996, 97:6.54
- Wharf/warehouse fire, Aug. 24, 1990, 91:6.73
- LOUISVILLE, KY.
 - Fire department and elderly agencies focus on seniors' fire safety, 94:3.13
 - Fire department training program for high-rise fires, 94:2.55
- LP-GAS FIRES. *See also* PROPANE
 - Bulk storage facility, Texas, 95:1.31
 - Burner ignites leaking hydrogen, 92:5.28
 - Gas directed into house, ignited in incendiary fire, 93:6.79
 - Grill tank, improperly installed, leaks, ignites restaurant fire, 98:3.36
 - Parts failure ignites gas at exterior wall at food processing plant, 98:6.86
 - Pilot light ignites gas from broken valve on LPG-powered cleaner, 97:6.57
 - Roofing torch, possible fire cause, 96:6.73
 - Stove flame ignites clothing of disable, elderly person, 98:2.16
 - Stove ignites gasoline residue on clothing, 94:5.97
 - Stove pilot light ignites aerosol insecticide, 93:4.25
 - Tank car derailment, Weyauwega, Wisc., March 4, 1996, 96:3.89
- LP-GAS FIRES AND EXPLOSIONS
 - BLEVE, Farm, Iowa, April 9, 1998, fire investigation report, 98:6.42
 - Bulk storage facility, Texas, April 7, 1992, 93:5.67, 93:6.87
 - Camping trailer, Alabama, Dec. 6, 1997, 98:5.56
 - Distribution facility, Ohio, 1996, 97:4.20
 - Forklift gas cylinder BLEVEs, 96:6.63
 - Manufactured home, Oklahoma, Apr. 20, 1996, 97:5.49
 - Store, Georgia, Oct. 26, 1997, 98:6.89
 - Tank truck, Mississippi, Jan. 20, 1992, 93:5.68
- LUCHT, DAVID A.
 - Profile of, 93:5.22
- M
- MADISON, WIS.
 - Cold storage warehouse fire, May 3, 1991, 91:6.37
- MAINE
 - Apartment building fire, 1995, 96:5.24
 - Fatal fires
 - Manufactured home, 1993, 94:1.31
 - Manufactured home, 1995, 96:6.22
 - Manufacturing plant fire, 1994, 95:5.34
 - Manufacturing plant fire, 1997, 98:1.24
 - Motel fire, March, 1994, 95:6.108

NFPA Journal
10 Year Index 1987-1997

Recreational facility fire, 1992, 93:1.26

MANAGEMENT MATTERS COLUMNS

Ethnic diversity and cooperation valued in fire service, 96:6.33

Evaluating fire service from community perspective, 96:3.49

Fire service must be prepared for terrorist attacks, 96:2.35

Leadership requires future goals based on principles, 96:1.33

Metropolitan fire chiefs and the NFPA, 96:4.33

Urban fire service need greater community service role, 96:5.35

MANN GULCH FIRE, MONT.

Wildland fire, 1949, 95:2.42

MANSION FIRES

Pennsylvania, 1993, 94:4.31

Utah, Dec., 1993, 94:6.90

MANUFACTURED HOME FIRES

Alabama, 1992, 93:4.25

Catastrophic

Arizona, March 26, 1995, 96:5.92

Arkansas, Dec. 28, 1997, 98:5.50

California, Dec. 30, 1997, 98:5.50

Georgia, April 11, 1994, 95:5.56

Georgia, Feb. 4, 1995, 96:5.92

Georgia, Dec. 14, 1996, 97:5.49

Idaho, Sept. 27, 1997, 98:5.46

Indiana, Oct. 1, 1996, 97:5.52

Iowa, Dec. 9, 1995, 96:5.93

Louisiana, April 10, 1990, 91:4.65

Michigan Feb. 6, 1990, 91:4.64

Ohio, Nov. 17, 1996, 97:5.51

Oklahoma, 1996, 97:5.49

South Carolina, Jan. 19, 1997, 98:5.45

Tennessee, March 4, 1994, 95:5.56

Washington, Aug. 8, 1990, 91:4.65

Colorado, 1997, 98:1.23

Florida, 1990, 91:4.26, 91:5.28

Florida, 1997, 98:4.20

Kansas, 1995, 96:3.36

Kentucky, 1993, 94:4.32, 94:5.27

Maine, 1993, 94:1.31

Maine, 1995, 96:6.22

Massachusetts, 1990, 91:2.29

Michigan, 1992, 93:6.28

New Jersey, 1997, 98:2.16

North Carolina, 1991, 92:2.28

North Carolina, 1997, 98:2.16

North Dakota, 1995, 96:2.23

Ohio, 1997, 98:3.38

Overview of fire experience, 92:3.62, 96:2.55

South Carolina, Sept. 6, 1996, 97:5.51

Washington, 1996, 97:3.30

MANUFACTURING PLANTS

Underground SubTropolis facility, Kansas City, Missouri, requires unique fire protection measures, 98:6.68

MANUFACTURING PLANT EXPLOSIONS

Paper, Florida, April 13, 1994, 95:5.66, 95:6.106

NFPA Journal
10 Year Index 1987-1997

Steel, Ohio, April 20, 1994, 95:5.64
MANUFACTURING PLANT FIRES. *See also* REFINERIES, OIL, FIRES
Adhesive, Ohio, 1993, 94:5.29
Agricultural products, Minnesota, August, 1992, 93:6.83
Aircraft, California, 1993, 94:4.31
Aircraft landing gear, California, Jan., 1992, 93:6.84
Alcohol distillery, Kentucky, Nov. 7, 1996, 97:6.57
Aluminum, Illinois, Aug., 1993, 94:6.94
Aluminum, Indiana, July, 1994, 95:6.102
Aluminum, Massachusetts, 1994, 95:1.33
Ammonium nitrate mixing, Minnesota, Nov. 17, 1993, 94:5.105
Apparel, Michigan, Aug., 1991, 92:6.78
Automobile parts, Michigan, 1992, 93:5.38
Automotive parts, Michigan, Aug. 6, 1997, 98:6.85
Bathtubs, Virginia, 1996, 97:4.22
Batteries, California, 1990, 91:3.31
Black powder, Pennsylvania, May 15, 1991, 92:4.71
Boats, Florida, 1992, 93:5.37
Boats, Florida, Sept. 5, 1996, 97:1.28, 6.50
Boats, Massachusetts, 1993, 94:1.29
Bottles, New Jersey, 1990, 91:6.25
Bottles, New York, 1992, 93:6.27
Bowling balls, Utah, 1990, 91:5.28
Brass rolling, Illinois, March, 1994, 95:6.108
Buses, Arkansas, July, 1994, 95:6.104
Cardboard, North Carolina, 1994, 95:3.40
Cardboard boxes, Massachusetts, June 6, 1997, 98:6.86
Cardboard boxes, Oregon, Feb. 19, 1990, 91:6.75
Carpets, Georgia, Jan., 1995, 96:6.62
Carpets, Georgia, 1996, 97:3.33
Causes, 94:4.40
Chemical fertilizer, Iowa, Dec. 13, 1994, 95:5.66
Chemicals, California, 1992, 93:4.27
Chemicals, Louisiana, May, 1991, 92:6.75
Chemicals, Louisiana, April 15, 1997, 98:6.84
Chemicals, Louisiana, May 1, 1991, 92:4.70
Chemicals, Louisiana, July, 1992, 93:6.83
Chemicals, North Carolina, 1995, 96:3.39
Chemicals, Ohio, 1990, 91:3.31
Chemicals, Ohio, May 27, 1994, 95:5.66
Chemicals, South Carolina, June, 1991, 92:6.80
Chemicals, South Carolina, June 17, 1991, 92:4.70
Chemicals, Texas, July 5, 1990, 91:4.67, 91:6.78
Chemicals, Texas, March, 1991, 92:6.75
Chemicals, Texas, Jan., 1992, 93:6.83
Chemicals, Texas, July, 1995, 96:6.64
Chemicals, Texas, Aug., 1995, 96:6.64
Chemicals and plastics, Minnesota, Feb. 6, 1997, 98:6.85
Chemicals and plastics, Utah, Feb. 1, 1997, 98:6.86
Christmas ornaments, North Carolina, Oct., 1994, 95:6.103
Circuit boards, California, 1993, 94:6.36
Clothing, North Carolina, May, 1992, 93:6.84
Coal preparation, Illinois, Dec., 1993, 94:6.93
Composting, Georgia, Aug. 23, 1996, 97:6.50

NFPA Journal
10 Year Index 1987-1997

Composting, Georgia, Dec. 24, 1996, 97:6.52
Connecticut, 1996, 97:4.22
Connecticut, 1997, 98:3.42
Dairy, South Carolina, 1991, 92:3.32
Dry cleaning/mixed, Michigan, April, 1994, 95:6.108
Electrical appliance, electronic equipment, Maryland, March 28, 1990, 91:6.77
Electronic appliances, New Hampshire, Aug. 22, 1996, 97:6.52
Electronics, Massachusetts, 1994, 95:3.40
Electronics repair, Texas, Oct., 1994, 95:6.108
Fiberboard, New York, 1995, 96:5.23
Fiberboard/hardboard, Oregon, Nov. 18, 1996, 97:6.50
Firearms, New Hampshire, March 27, 1997, 98:6.86
Fireworks, Mississippi, 1990, 91:4.30
Fireworks, Wisconsin, May 16, 1991, 92:4.71
Foam, California, 1997, 98:3.41, 6.21
Foam carpet padding, New Jersey, 1990, 91:5.30
Foam rubber, California, 1995, 96:6.23
Food processing, Alaska, April 25, 1997, 98:6.92
Food processing, Alaska, April 3, 1997, 98:6.84
Food processing, Arizona, Nov. 12, 1992, 93:4.33
Food processing, Arkansas, May, 1995, 96:6.64
Food processing, California, April, 1994, 95:6.107
Food processing, California, 1997, 98:6.22
Food processing, Illinois, Sept., 1992, 93:6.83
Food processing, Illinois, Oct., 1995, 96:6.65
Food processing, Indiana, June, 1994, 95:6.103
Food processing, Indiana, Dec. 24, 1997, 98:6.84
Food processing, Michigan, March 1, 1996, 97:6.50
Food processing, Minnesota, May 4, 1997, 98:6.86
Food processing, Missouri, Oct., 1994, 95:6.104
Food processing, New Jersey, 1992, 93:2.20
Food processing, North Carolina, Sept. 3, 1991, 92:1.29, 92:4.70
Food processing, Ohio, Nov. 1, 1996, 97:6.49
Food processing, Oregon, July, 1995, 96:6.64
Food processing, Pennsylvania, June, 1991, 92:6.80
Food processing, Tennessee, Sep. 18, 1997, 98:6.85
Food processing, Virginia, Sept. 1, 1996, 97:6.50
Food processing, Washington, Jan. 5, 1995, 96:5.96
Foundry, Iowa, 1989, 91:1.31
Furniture, California, 1990, 91:6.25
Furniture, Georgia, March, 1994, 95:6.106
Furniture, Illinois, Feb. 7, 1996, 97:6.52
Furniture, Indiana, Oct., 1994, 95:6.104
Furniture, New York, 1995, 96:5.26
Furniture, New York, Aug., 1995, 96:6.65
Furniture, North Carolina, Oct., 1994, 95:6.103
Furniture, North Carolina, 1995, 96:4.24
Furniture, Pennsylvania, 1992, 93:1.28
Furniture, Texas, Apr. 23, 1996, 97:6.49
Furniture, Utah, 1990, 91:2.31
Furniture, Virginia, Feb., 1993, 94:6.93
Furniture refinishing, Pennsylvania, Dec. 20, 1991, 92:3.73, 92:4.71
High-energy fuel, Wyoming, 1993, 94:3.30
Hosiery, North Carolina, 1996, 97:3.33

NFPA Journal
10 Year Index 1987-1997

Ice cream, Arkansas, 1990, 91:5.28
Incinerators, Pennsylvania, 1990, 91:5.28
Ink, Texas, 1992, 93:1.28
Ink and dyes, Ohio, July 10, 1990, 91:6.74
Iron foundry, Illinois, May 1, 1996, 97:6.50
Jewelry, California, Jan. 12, 1990, 91:6.75
Knitting mill, Pennsylvania, Sept. 5, 1997, 98:6.84
Laundry and dry-cleaning, New Mexico, March, 1992, 93:6.85
Machine shop, California, 1990, 91:6.25
Machines, Minnesota, Dec., 1992, 93:6.83
Magnesium smelting operation, New Jersey, 1992, 93:3.34
Magnets, Pennsylvania, Dec., 1993, 94:6.95
Maintenance shop, California, 1993, 94:4.31
Meat packing, Texas, June, 1991, 92:6.79
Meat processing, California, March, 1994, 95:6.106
Meat processing, Iowa, March 30, 1996, 97:6.49
Meat processing, Kentucky, Feb., 1994, 95:6.106
Medical supplies, Oklahoma, 1992, 93:5.37
Metal, Maryland, Dec., 1992, 93:6.85
Metal building components, Texas, Jan. 31, 1997, 98:6.86
Metal extrusion, South Carolina, Jan., 1993, 94:6.95
Metal fabrication, California, 1997, 98:2.20
Metal foundry, Indiana, June 22, 1995, 96:5.97
Metal milling, Pennsylvania, Jan. 31, 1997, 98:6.85
Metal preparation, South Dakota, Dec. 15, 1990, 91:6.75
Metal processing, Newton, Massachusetts, Oct. 25, 1993, 94:6.63
Metal products, Indiana, May, 1995, 96:6.65
Metal products, Iowa, March 23, 1996, 97:6.52
Metal products, Ohio, Sept. 13, 1996, 97:6.52
Metal products machining, California, Aug. 26, 1997, 98:6.84
Metal storage lockers, Michigan, Jan., 1993, 94:6.95
Methanol production, Texas, Oct., 1994, 95:6.102
Mixed industry, Virginia, April, 1995, 96:6.63
Mixed light industry, Massachusetts, Jan., 1992, 93:6.84
Motion picture studio/manufacturing plant, California, Nov. 6, 1990, 91:6.74
Natural gas and gasoline, California, 1992, 93:6.29
Nylon, Virginia, Nov., 1992, 93:6.82
Paint, California, 1991, 92:4.28
Paper, New York, Nov., 1995, 96:6.62
Paper, Ohio, 1996, 97:5.24
Paper and liner board, Florida, Nov., 1993, 94:6.94
Paper and pulp products, Iowa, Feb., 1995, 96:6.63
Paper containers, corrugated, Texas, 1995, 96:6.23
Pennsylvania, July 4, 1997, 98:6.86
Pens, Illinois, Sept., 1994, 95:6.107
Pet food, Utah, 1993, 94:3.29
Petroleum products, Texas, 1996, 97:2.24
Pharmaceutical, New Jersey, Apr. 21, 1995, 96:5.94
Pharmaceutical packaging, Illinois, 1997, 98:4.20
Plastic auto bumpers, Michigan, June, 1993, 94:6.93
Plastic auto parts, Ohio, Oct., 1994, 95:6.103
Plastic shower doors, Washington, Jan., 1993, 94:6.95
Plastics, Iowa, 1996, 97:1.28
Plastics, Massachusetts, Feb., 1994, 95:6.107

NFPA Journal
10 Year Index 1987-1997

Plastics, North Carolina, 1994, 95:2.32
Plastics recycling, Michigan, Aug. 27, 1997, 98:6.85
Plastics recycling, New York, July 29, 1997, 98:6.87
Plastics recycling and shredding, 1995, 96:5.23
Plywood, South Carolina, Jan. 1992, 93:6.83
Plywood, Washington, Sept. 1, 1996, 97:6.49
Polyurethane foam, Arkansas, Aug., 1994, 95:6.107
Polyurethane foam, North Carolina, 1989, 91:3.29
Pottery, china, earthenware, Ohio, Oct., 1994, 95:6.104
Pottery, Ohio, June 16, 1996, 97:6.52
Poultry processing, Arkansas, Dec., 1993, 94:6.94
Poultry processing, Arkansas, 1994, 95:6.106
Poultry processing, Missouri, June, 1993, 94:6.93
Poultry processing, Pennsylvania, Feb., 1993, 94:6.95
Poultry processing, Texas, July, 1993, 94:6.94
Printing, Arkansas, 1992, 93:4.27
Printing, May, 1993, 94:6.94
Printing, Ohio, June, 1992, 93:6.84
Printing, Ohio, March, 1995, 96:6.63
Printing, Oregon, July, 1992, 93:6.84
Printing, Wisconsin, 1994, 95:2.30
Protective materials, Maine, 1994, 95:5.34
Pyrotechnics, Tennessee, June 5, 1997, 98:5.53
Railroad cars, Illinois, 1994, 95:3.38
Rock processing, Wisconsin, 1993, 94:6.36
Rubber, California, 1994, 95:4.40
Rubber products, Georgia, Aug. 24, 1996, 97:6.52
Sawmill, Wyoming, 1991, 92:1.26
Shingles, British Columbia, 92:2.26
Shoe manufacturing, New York, Dec., 1993, 94:6.98
Soap, Kansas, 1989, 91:5.30
Solvent distillation, Ontario, Canada, 1992, 93:6.27
South Carolina, Nov. 4, 1997, 98:6.87
Sports equipment, Texas, Aug. 28, 1997, 98:6.87
Steel, Ohio, 1994, 95:6.37
Steel, Ohio, Jan., 1995, 96:6.65
Steel, Oregon, 1993, 94:3.29
Steel, West Virginia, April, 1994, 95:6.102
Steel processing, Ohio, Aug. 14, 1997, 98:6.84
Sugar refinery, Nebraska, July 20, 1996, 97:6.49
Tannery, Maine, 1997, 98:1.24
Texas, June 29, 1997, 98:6.85
Textiles, Alabama, Feb., 1994, 95:6.107
Textiles, Massachusetts, Dec., 1995, 96:6.62
Textiles, North Carolina, 1992, 93:5.37
Toys, California, Nov. 15, 1997, 98:5.53
Toys, China, Nov. 19, 1993, 94:1.48
Toys, Thailand, May 10, 1993, 94:1.42
Triangle Shirtwaist Co. fire stirred outrage, reform, 93:3.72
Vehicle conversion, Indiana, Aug., 1995, 96:6.65
Vessel filters, Texas, 1990, 91:6.24
Winery, California, 1997, 98:4.21
Wire, Illinois, 1994, 95:2.32
Wood products, Indiana, March 19, 1996, 97:6.50

NFPA Journal
10 Year Index 1987-1997

Wood products, Minnesota, Dec. 2, 1997, 98:6.87
Yarn dyeing, Georgia, 1994, 95:2.32

MARINAS

Electrical safety requirements, 95:5.40

MARINA FIRES

Connecticut, 1990, 91:6.26
Washington, 1990, 92:1.26

MARYLAND

Catastrophic fires

Dwelling, March 1, 1990, 91:4.67
Dwelling, July 7, 1992, 93:5.62
Dwelling, Apr. 23, 1993, 94:5.98
Dwelling, Jan. 9, 1994, 95:5.54
Dwelling, Feb. 26, 1994, 95:5.53
Dwelling, Jan. 30, 1996, 97:5.50
Dwelling, March 3, 1997, 98:5.45
Railroad train, Feb. 16, 1996, 97:5.54, 6.59
School, Oct. 24, 1993, 94:5.105
Truck, Jan. 16, 1993, 94:5.108

Club fire, Aug., 1993, 94:6.89

Fatal fires

Apartment, 1989, 91:2.29
Apartment building, 1991, 92:3.34
Dwelling, 1993, 94:1.31
Dwelling, 1994, 95:3.38
Dwelling, 1997, 98:5.16
Manufacturing plant fire, March 28, 1990, 91:6.77
Manufacturing plant fire, Dec., 1992, 93:6.85
Storage facility fire, 1992, 93:1.26
Store fire, 1991, 92:3.31

MASSACHUSETTS

Aircraft fire, 1997, 98:4.22
Apartment building fire, 1990, 91:3.26
Apartment building fire, 1995, 96:1.22
Apartment complex fire, 1989, 91:3.26
Automobile repair shop fire, 1996, 97:2.23
Barge fire, 1997, 98:4.22
Barn fire, 1995, 96:2.25
Board and care facility fire, 1995, 96:2.24
Boat fire, 1994, 95:4.39
Building-under-renovation fire, 1997, 98:3.42
Catastrophic fire
Apartment building, March 21, 1994, 95:5.59
Apartment building, Dec. 28, 1997, 98:5.49
Dwelling, May 27, 1990, 91:4.65
Dwelling, Dec. 24, 1994, 95:5.54
Church fire, 1992, 93:2.21
Dwelling fire, 1991, 92:1.21
Dwelling fire, 1995, 96:4.21, 96:6.22
Dwelling fire, 1996, 97:4.19
Dwelling-under-construction fire, 1994, 95:1.34
Fatal fires
Apartment building, 1992, 93:6.28
Apartment building, 1994, 95:5.34

NFPA Journal
10 Year Index 1987-1997

- Apartment building, 1997, 98:4.19
- Dwelling, 1989, 91:1.27
- Dwelling, 1992, 93:1.27, 93:5.36
- Dwelling, 1993, 94:6.34
- Dwelling, 1995, 96:2.24, 96:5.24
- Dwelling, 1996, 97:1.25
- Dwelling, 1997, 98:5.15
- Garage, residential, fire, 1996, 97:6.20
- Housing for elderly, 1992, 93:6.28
- Manufactured home, 1990, 91:2.29
- Truck/repair shop fire, 1997, 97:5.24
- Government building, 1991, 92:6.26
- Greenhouse fire, 1991, 92:4.25
- High-rise office building fire, 1991, 92:5.28
- Hospital fire, Jan. 24, 1993, 93:5.49
- Hospital fire, 1995, 96:5.26
- Hospital fire, Oct. 16, 1996, analysis, 97:3.88
- Kennel fire, 1992, 93:2.20
- Manufacturing plant fire, Jan., 1992, 93:6.84
- Manufacturing plant fire, 1993, 94:1.29
- Manufacturing plant fire, Oct. 25, 1993, 94:6.63
- Manufacturing plant fire, 1994, 95:1.33, 95:3.40
- Manufacturing plant fire, Feb., 1994, 95:6.107
- Manufacturing plant fire, Dec., 1995, 96:6.62
- Manufacturing plant fire, June 6, 1997, 98:6.86
- Meeting hall fire, 1997, 98:1.21
- Motor vehicle repair shop fire, 1990, 91:2.31
- Multiple-occupancy building fire, 1991, 92:1.23
- Nursing home fire, 1997, 98:5.17
- Nursing home fire, Oct. 30, 1992, 93:5.49
- Nursing home fire, 1994, 95:5.33
- Office building fires, 1995, 96:2.24
- Postal facility under construction fire, 1990, 91:3.27
- Restaurant fires, Wayside Inn, 1955, 1965, 94:6.75
- Restaurant fire, 1996, 97:4.22, 5.22
- Rooming house fire, 1996, 97:1.26, 6.19
- School fire, 1991, 92:4.27
- School fire, 1992, 93:3.33
- Service station fire, 1995, 96:6.21
- Storage facility fire, 1991, 92:5.28
- Storage facility fire, 1993, 94:2.27
- Storage facility fire, 1996, 97:2.23
- Store fire, 1992, 93:3.36
- Store fire, 1994, 95:4.39, 95:5.36
- Store fire, May, 1995, 96:6.70
- Store fire, May 23, 1995, 98:1.50
- Supermarket fire, 1989, 91:1.28
- Warehouse fire, Nov., 1993, 94:6.97
- Warehouse fire, 1994, 95:1.32
- MATCHES. *See also* CHILDREN AND MATCHES**
- Bedding ignited by, 94:5.97
- Draperies ignited by, 94:5.104
- MATTERN, JEFFREY**
- Profile of, 97:4.34

NFPA Journal
10 Year Index 1987-1997

MATTRESSES. *See also* **BEDDING**

- Arcing of electric heater, ignited by, 92:4.67
- Child, ignited by, 92:4.70
- Child(ren) with lighter, ignited by, 93:6.28, 95:5.34
- Child(ren) with matches, ignited by, 92:5.25
- Cigarette, ignited by, 95:6.35
- Detention center inmate, ignited by, 97:1.27
- Juvenile with cigarette lighter, ignited by, 91:5.26
- Juvenile with rubbing alcohol, ignited by, 92:4.67
- Kerosene heater, ignited by, 95:1.34
- Mercury vapor light fixture, ignited by, 95:4.39

MAURY COUNTY, TENN.

- Detention facility fire, June 26, 1977, 94:5.50

MCCROSSEN, BILL

- New Orleans fire chief retires, 93:5.18

MCDANIELS, WARREN

- Profile of, 98:2.33

MGM GRAND HOTEL FIRE

- Overview of fire, 96:2.70

MICHIGAN

- Apartment building fire, Feb., 1994, 95:6.99
- Catastrophic fires
 - Aircraft collision, Dec. 3, 1990, 91:3.69, 91:4.70
 - Apartment building, July 31, 1991, 92:4.68
 - Apartment building, Feb. 28, 1993, 94:5.95
 - Board and care facility, June 2, 1992, 93:5.66
 - Board and care facility, Nov. 11, 1995, 96:5.97
 - Dwelling, Feb. 28, 1990, 91:4.64
 - Dwelling, Dec. 22, 1990, 91:4.64
 - Dwelling, Oct. 3, 1992, 93:5.62
 - Dwelling, Dec. 3, 1992, 93:5.64
 - Dwelling, Feb. 17, 1993, 94:5.96
 - Dwelling, Nov. 30, 1993, 94:5.102
 - Dwelling, July 13, 1994, 95:5.56
 - Manufactured home, Feb. 6, 1990, 91:4.64
- Chemical laboratory fire, 1991, 92:3.33
- Country club fire, 1990, 91:6.23
- Dwelling fire, 1991, 92:6.28
- Dwelling fire, Jan. 6, 1996, 97:6.58
- Dwelling fire, Nov. 14, 1996, 97:6.58
- Electric generating plant fire, Apr. 26, 1996, 97:6.59
- Fatal fires
 - Automobile repair shop, 1995, 96:3.40
 - Board and care facility, June 2, 1992, 93:1.29
 - Dwelling, 1991, 92:6.28
 - Dwelling, 1993, 94:6.33
 - Dwelling, Feb. 17, 1993, 93:3.57
 - Dwelling, 1995, 96:3.39
 - Dwelling, 1996, 97:1.25
 - Motel, 1994, 95:1.33
- Funeral home fire, 1995, 96:6.24
- Hotel fire, 1991, 92:1.22
- Hotel fires, 1997, 98:3.41
- Manufactured home fire, 1992, 93:6.28

NFPA Journal
10 Year Index 1987-1997

- Manufacturing plant fire, Aug., 1991, 92:6.78
- Manufacturing plant fire, Aug. 6, 1997, 98:6.85
- Manufacturing plant fire, Aug. 27, 1997, 98:6.85
- Manufacturing plant fire, 1992, 93:5.38
- Manufacturing plant fire, Jan. 1993, 94:6.95
- Manufacturing plant fire, June, 1993, 94:6.93
- Manufacturing plant fire, April, 1994, 95:6.108
- Manufacturing plant fire, 1995, 96:5.23
- Manufacturing plant fire, March 1, 1996, 97:6.50
- Motor vehicle repair shop fire, 1990, 91:2.30
- Nursing home fire, 1990, 91:4.25
- Office building fire, Aug. 4, 1996, 97:6.53
- Restaurant fire, 1990, 91:2.32, 91:6.23
- Restaurant fire, 1994, 95:1.34
- Restaurant fire, 1995, 96:3.35
- Storage facilities fire, 1996, 97:5.24
- Store fire, 1991, 92:6.25
- Store fire, 1993, 94:4.30
- Store fire, Dec., 1995, 96:6.69
- Store fire, Jan. 25, 1996, 97:6.53
- Truck fire, 1991, 92:6.29
- Vacant building fire, 1991, 92:2.29
- Warehouse fire, 1997, 98:6.24
- Warehouse fire, Dec., 1992, 93:6.87
- Warehouse fire, 1993, 94:6.34
- Warehouse fire, 1995, 96:3.39
- Warehouse fire, Oct. 16, 1996, 97:6.56
- MICKALIDE, ANGELA D.
 - Profile of, 98:5.30
- MILL FIRES
 - Fiber mill, North Carolina, 1991, 92:5.30
 - Furniture, Virginia, Feb., 1993, 94:6.93
 - Grain mill, Illinois, Oct., 1995, 96:6.65
 - Grain mill and storage facility, Washington, 1991, 92:4.28
 - Knitting, Pennsylvania, Sept. 5, 1997, 98:6.84
 - Paper, Florida, April 13, 1994, 95:5.66, 95:6.106
 - Paper mill warehouse, Michigan, 1993, 94:6.34
 - Pennsylvania, July 4, 1997, 98:6.86
 - Sawmill, Louisiana, 1993, 94:5.29
 - Sawmill and manufacturing plant, California, March, 1991, 92:6.79
 - Shoe manufacturing, New York, Dec., 1993, 94:6.98
 - Steel, West Virginia, April, 1994, 95:6.102
 - Textiles, Massachusetts, Dec., 1995, 96:6.62
 - Vacant, Connecticut, 1995, 96:2.25
- MILLER, GEORGE D.
 - Interview with, 92:3.40, 95:3.84
 - Selection as new president of NFPA, 92:3.4
- MINE FIRES. *See* COAL MINE FIRES
- MINNESOTA
 - Catastrophic fires
 - Apartment building, Nov. 10, 1993, 94:5.97
 - Apartment building, Feb. 28, 1994, 95:5.58
 - Apartment building, Jan. 14, 1996, 96:5.91
 - Gas pipeline, July 22, 1993, 94:5.108

NFPA Journal
10 Year Index 1987-1997

Hotel, July 12, 1991, 92:4.67
Manufacturing plant/storage facility, Nov. 17, 1993, 94:5.105
Dwelling fire, 1991, 92:2.28
Manufacturing plant fire, August, 1992, 93:6.83
Manufacturing plant fire, Dec., 1992, 93:6.83
Manufacturing plant fire, Feb. 6, 1997, 98:6.85
Manufacturing plant fire, May 4, 1997, 98:6.86
Manufacturing plant fire, Dec. 2, 1997, 98:6.87
Restaurant fire, 1991, 92:6.25
School fire, April, 1994, 95:6.98
School-under-construction fire, 1994, 95:3.39
Warehouse fire, July, 1995, 96:6.66

MISSISSIPPI

Catastrophic fires
Apartment building, Jan. 26, 1993, 94:5.95
Dwelling, April 3, 1994, 95:5.59
Dwelling, Feb. 3, 1996, 97:5.49
Dwelling, March 13, 1996, 97:5.50
Nursing home, Apr. 9, 1995, 96:5.96
Truck, Jan. 20, 1992, 93:5.68
Fatal fires
Dwelling, 1994, 95:4.38
Fireworks plant explosion and fire, 1990, 91:4.30
Hotel fire, 1995, 96:5.24
School building fire, 1990, 91:3.27
Store fire, 1993, 94:1.32

MISSOURI

Catastrophic fires
Automobile, Feb. 4, 1990, 91:4.70
Dwelling, Aug. 19, 1992, 93:5.64
Dwelling, Dec. 5, 1997, 98:5.45
Prison, Sept. 14, 1991, 92:4.70
Tank storage facility, Sept. 8, 1992, 93:5.67
Truck, April 16, 1990, 91:4.70
Church fire, 1997, 98:2.19
Electric generating plant fire, June, 1993, 94:6.92
Fatal fires
Apartment building, 1994, 95:3.37
Dwelling, 1991, 92:3.34
Dwelling, 1992, 93:4.25
Dwelling, 1994, 95:5.34
Storage shed fire, 1997, 98:3.36
Hospital fire, 1997, 98:5.17
Housing-for-elderly complex fire, 1989, 91:1.30
Manufacturing plant fire, June, 1993, 94:6.93
Manufacturing plant fire, Oct., 1994, 95:6.104
Meeting hall fire, 1997, 98:2.19
Shopping mall fire, 1997, 98:2.20
Storage building fire, 1997, 98:5.18
Store fire, 1996, 97:6.22
Underground SubTropolis storage/manufacturing facility, Kansas City, requires unique fire protection measures, 98:6.68
Warehouse fire, 1991, 92:6.26
Warehouse fire, March, 1992, 93:6.85

NFPA Journal
10 Year Index 1987-1997

- Warehouse fire, Feb. 24, 1997, 98:6.88
- Warehouse fire, March 16, 1997, 98:6.87
- MIXED OCCUPANCIES. *See* MULTIPLE-OCCUPANCY FIRES
- MOBILE HOME FIRES. *See* MOTOR HOME FIRES
- MODELS, FIRE. *See* FIRE MODELS
- MONTANA
 - Catastrophic fires
 - Dwelling, Sept. 7, 1991, 92:4.68
 - Dwelling, Sept. 24, 1994, 95:5.60
 - Wildland fire, Mann Gulch, 1949, 95:2.42
- MOORE, WAYNE D.
 - Profile of, 94:4.23
- MORGAN, CHARLES S.
 - General manager and past president of NFPA, 96:1.66
- MOSES, THOMAS M.
 - Profile of, 91:1.14
- MOTEL FIRES. *See* HOTEL FIRES
- MOTION PICTURE STUDIO FIRES
 - Arizona, April, 1995, 96:6.73
 - California, Nov. 6, 1990, 91:6.74
- MOTOR HOME FIRES. *See also* MANUFACTURED HOME FIRES
 - California, 1994, 95:5.36
 - Catastrophic
 - California, July 30, 1990, 91:4.72
 - Tennessee, Aug. 14, 1992, 93:5.68
- MOTOR VEHICLE FIRES. *See* VEHICLE FIRES
- MOTOR VEHICLE REPAIR SHOPS. *See* AUTOMOBILE REPAIR SHOP FIRES
- MULTI-AGENCY RESPONSE
 - Ship fire, 94:6.98
- MULTIPLE-OCCUPANCY FIRES
 - California, 1990, 91:6.25
 - Catastrophic, New York, Jan. 16, 1990, 91:4.65
 - Florida, 1996, 97:3.29
 - Illinois, 1992, 93:3.34
 - Indiana, 1992, 92:6.31
 - Kansas, June, 1991, 92:6.78
 - Massachusetts, 1991, 92:1.23
 - Protecting mixed occupancies, 97:3.38
 - Tennessee, July, 1992, 93:6.81
 - Vermont, 1989, 91:1.27
- MUSEUMS
 - Life safety system for Winterthur, 92:5.63
- MUSEUM FIRES
 - Oregon, 1994, 95:6.35
 - Tennessee, July, 1992, 93:6.81
 - Wisconsin, June, 1994, 95:6.98
- MUTUAL AID RESPONSE
 - Apply mutual aid to fire investigations, 93:1.14
 - Cardboard box manufacturing plant fire, 98:6.86
 - Chemical plant fire, 93:4.27
 - Cotton warehouse, Missouri, Feb. 24, 1997, 98:6.88
 - Making mutual aid agreements work, 91:2.49
 - Manufacturing plant fires, 95:6.104, 107
 - Metal milling plant fire, 98:6.85

NFPA Journal
10 Year Index 1987-1997

Open-air flea market fire, 98:6.89
Records storage facility fire, 98:6.91
Rural fire, 91:4.26
Simultaneous incendiary fires, 93:3.34
Wood products plant fire, 98:6.87

N

NACHBAR, MARY

Profile of, 94:5.21

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

Apollo I spacecraft fire, 96:1.68
Space program technology applied to tank truck fires by NFPA, Chicago Fire Dept.,
NASA partnership, 98:2.52

NATIONAL ELECTRICAL CODE

1993 edition, changes in, 92:5.50
1996 edition, development of, 95:5.73
1999 edition incorporates technological changes supported by consensus process,
98:5.66
Boat repair safety requirements for wiring, equipment, 95:5.40
Experts answer questions on code, 96:1.28
Global marketplace and, 91:3.120
High voltage equipment safety, 95:2.34
Hot tub and spa accident prevention, 92:4.22
Interpreting the code, 92:5.12
Main service disconnect terms and requirements, 91:6.88
Questions answered, 97:6.25
Spanish speaking countries using code, 96:1.28
U. S. cable/wire manufacturers promote NEC over IEC as European standard, 98:4.64
Work space requirements for energized electrical equipment, 95:1.37

NATIONAL FIRE INCIDENT REPORTING SYSTEM (NFIRS)

History and use of data, 98:3.80

NATIONAL INTERAGENCY INCIDENT MANAGEMENT SYSTEM (NIMS)

Discussion, 91:3.123

NATIVE AMERICANS

Navajo Nation and NFPA Center for High-Risk Outreach cooperate for fire safety,
97:2.74
Navajo Nation fire safety awareness campaign, 96:5.71
Smoke detector nuisance alarms: field study in Native American community, 96:5.65

NATURAL GAS FIRES

Aircraft parts made of resin ignited by gas, 94:4.31
Boiler ruptured, ignited when, 93:6.83
Burners ignite hydraulic oil, 92:4.70
Burning rubbish, ignited by, 91:4.25
Cigarette, ignited by, 93:1.25
Flame from LP-Gas fire causes natural gas regulator to fail, leaking gas ignites, 98:3.36
Flash fire, ignited by, 91:3.26
Heater, ignited by, when piping accidentally ruptured, 94:1.30
Heater ignites gasoline vapors, 97:2.23
Hydraulic oil from split line, ignited by, 94:3.29
Ignition source unknown, 92:4.71
Infrared heater, ignited by, 96:6.65
Leak in furnace enclosure fuels catastrophic fire, 97:5.52
Lines ruptured, ignited when, 95:6.103
Oil fire, ignited by, 92:1.29
Oven/broiler malfunctions, ignites kitchen wall, 97:5.52

NFPA Journal
10 Year Index 1987-1997

Pilot light, ignited by, 91:4.64, 92:4.68, 92:6.25, 95:3.39
Pilot light ignites gasoline, 96:5.91
Pilot light ignites gasoline vapors, 92:5.26
Pipeline supplying kiln fails, gas ignited by pilot flame, 97:6.52
Pressure surge caused by vehicle accident causes manufactured homes fire, 96:3.36
Production and storage facility fire, 93:6.29
Roof fire, ignited by, 94:6.35
Space heater, ignited by, 91:4.66
Spark, ignited by, 91:6.74
Stove burners, ignited by, 91:4.65

NATURAL GAS FIRES AND EXPLOSIONS

Electrical equipment ignites gas built up in drilling platform structure, 5.53, 98:6.91
Gas distribution main over-pressured causes flare-ups, explosions, 93:5.68
Lacquer thinner vapors ignited by, 94:5.104
Leak from service line, ignited by refrigeration compressor, 95:5.62
Leak ignited, 94:5.108, 95:1.33, 95:6.103
Spark, ignited by, 93:5.94
Windows opened to vent fire leads to gas ignition, 94:6.64

NEBRASKA

Apartment building fire, 1996, 97:5.22
Fatal boat fire, 1994.310
Manufacturing plant fire, July 20, 1996, 97:6.49
Storage facility fire, March, 1995, 96:6.69
Warehouse fire, Apr. 12, 1996, 97:6.57

NELSON, HAROLD E.

Profile of, 93:1.21

NELSON, JENNIFER L.

Profile of, 93:2.17

NEVADA

Fatal shopping mall fire, 1992, 93:2.19
Hotel fires, 1997, 98:5.16
MGM Grand Hotel fire, Nov. 21, 1980, 96:2.70

NEW BRUNSWICK, CANADA

Detention facility fire, June 21, 1977, 94:5.50

NEW HAMPSHIRE

Catastrophic dwelling-under-construction fire, Dec. 12, 1990, 91:4.68
Fatal fireworks display fire, 1995, 96:4.24
Fireworks plant explosion and fire, 1992, 93:3.35
Group home fire, 1990, 92:1.26
Manufacturing plant fire, Aug. 22, 1996, 97:6.52
Manufacturing plant fire, March 27, 1997, 98:6.86
Nursing home fire, 1991, 92:6.29
Storage facilities fire, Jan. 8, 1996, 97:6.56

NEW JERSEY

Amusement center fire, Dec., 1992, 93:6.79
Apartment building fire, 1996, 97:5.22
Apartment complex fire, 1993, 94:1.32
Catastrophic fires
Apartment building, Feb. 13, 1991, 92:4.69
Apartment building, May 6, 1997, 98:5.45
Automobile, New Jersey, Feb. 17, 1997, 98:5.55
Dwelling, June 11, 1991, 92:4.69
Dwelling, June 16, 1991, 92:4.69
Dwelling, Feb. 13, 1992, 93:5.62

NFPA Journal
10 Year Index 1987-1997

- Dwelling, Dec. 28, 1994, 95:5.53
- Dwelling, Jan. 22, 1995, 96:5.92
- Dwelling, July 22, 1996, 96:5.92
- Electric/thermal energy generating plant, Dec. 25, 1992, 93:2.44, 93:5.67, 93:6.82
- Manufacturing plant, Apr. 21, 1995, 96:5.94
- Fatal fires
 - Apartment building, 1991, 92:2.28
 - Apartment building, 1997, 98:3.41
 - Dwelling, 1994, 95:6.37
 - Manufactured home, 1997, 98:2.16
- Funeral home fire, 1996, 97:2.21
- Hotel/conference center fire, 1993, 94:2.30
- Manufacturing plant fire, 1990, 91:5.30, 91:6.25
- Manufacturing plant fire, 1992, 93:2.20, 93:3.34
- Shopping mall fire, 1997, 98:6.21
- Store fire, 1990, 92:1.21
- Store fire, Jan., 1991, 92:6.78
- Store fire, April 17, 1997, 98:6.89
- Warehouse fire, 1989, 91:2.33
- Warehouse fire, Jan. 10, 1996, 97:6.56
- Warehouse fire, Iron Mountain records storage facility, South Brunswick, March, 1997, 98:2.68
- Wildland fire, 1995, 96:2.26
- NEW LONDON, TEXAS
 - School explosion, March 18, 1937, 93:5.94
- NEW MEXICO
 - Aircraft fire and crash, Sept., 1993, 94:6.98
 - Apartment complex fire, July, 1995, 96:6.74
 - Manufacturing plant fire, March, 1992, 93:6.85
 - Store fire, May, 1995, 96:6.70
- NEW ORLEANS, LA.
 - Fire department profile, 92:2.61
- NEW YORK
 - Aircraft fire, March, 1991, 92:6.79
 - Aircraft fire, Sept. 5, 1996, 97:6.60
 - Aircraft fire, Sept., 1992, 93:6.88
 - Apartment building fire, 1993, 94:5.27
 - Apartment building fire, May, 1993, 94:6.90
 - Apartment building fire, March 28, 1994, 95:6.85
 - Catastrophic fires
 - Aircraft, March 22, 1992, 93:5.68
 - Apartment building, Aug. 4, 1990, 91:4.66
 - Apartment building, March 13, 1991, 92:4.67
 - Board and care facility, Oct. 17, 1990, 91:4.68
 - Club, March 25, 1990, 91:4.61, 67
 - Dwelling, Dec. 27, 1990, 91:4.65
 - Dwelling, Feb. 8, 1991, 92:4.68
 - Dwelling, April 10, 1991, 92:4.67
 - Dwelling, April 21, 1991, 92:4.69
 - Dwelling, Nov. 22, 1991, 92:4.68
 - Dwelling, Dec. 22, 1991, 92:4.68
 - Dwelling, June 7, 1993, 94:5.98
 - Dwelling, Aug. 28, 1993, 94:5.100
 - Dwelling, Dec. 21, 1993, 94:5.102

NFPA Journal
10 Year Index 1987-1997

- Dwelling, Jan. 28, 1994, 95:5.58
- Dwelling, Feb. 10, 1994, 95:5.54
- Dwelling, June 28, 1994, 95:5.60
- Dwelling, Dec. 4, 1994, 95:5.62
- Dwelling, June 23, 1995, 96:5.92
- Dwelling, Dec. 18, 1995, 96:5.93
- High-rise complex, Feb. 26, 1993, 93:6.91, 94:5.104, 94:6.90, 95:2.59
- Hospital, Sept. 1, 1993, 94:5.105
- Motor vehicle, May 20, 1991, 92:4.72
- Multiple-occupancy/dwelling, Jan. 16, 1990, 91:4.65
- Store, Dec. 8, 1995, 96:5.94
- Store/apartment building fire, Aug. 22, 1994, 95:5.66
- Wharf/boardwalk, Feb. 12, 1997, 98:5.53
- Dumpster fire, 1995, 96:5.26
- Electric generating plant fire, May, 1992, 93:6.82
- Electric generating plant fire, March, 1993, 94:6.91
- Fatal fires
 - Aircraft, March, 1992, 93:6.88
 - Apartment building, 1996, 97:6.20
 - Apartment building, 1997, 98:2.18
 - Dwelling, 1991, 92:5.25
 - Dwelling, 1992, 93:2.22
 - Dwelling, 1993, 94:1.31
 - Dwelling, 1994, 95:4.37
 - Subway token booth, 1995, 96:6.24
- Laboratory fire, 1995, 96:3.40
- Manufacturing plant fire, 1992, 93:6.27
- Manufacturing plant fire, 1995, 96:5.23, 96:5.26
- Manufacturing plant fire, Aug., 1995, 96:6.65
- Manufacturing plant fire, Nov., 1995, 96:6.62
- Manufacturing plant fire, July 29, 1997, 98:6.87
- Medical center complex fire, July 21, 1990, 91:6.78
- Mill complex fire, Dec., 1993, 94:6.98
- Office building/apartment building fire, Aug., 1994, 95:6.100
- Office building fire, New York, 1996, 97:6.22
- Passenger terminal fire, Sept., 1991, 92:6.76
- Shopping mall fire, May, 1991, 92:6.77
- Storage complex fire, June 12, 1990, 91:6.74
- Storage facility fire, March, 1995, 96:6.69
- Storage facility fire, July, 1995, 96:6.68
- Store fire, April, 1993, 94:6.91
- Warehouse fire, 1993, 94:1.30
- Wildland/urban interface fire, Aug., 1995, 96:6.74
- NEW YORK, N. Y.
 - Asbestos exposure response policy, 92:1.42
 - Backdraft incident model, apartment building fire, March 28, 1994, 95:6.85
 - Manufacturing plant fire, March 25, 1911, 93:3.72
 - World Trade Center explosion and fire, Feb. 26, 1993, 93:6.91, 94:5.104, 94:6.90, 95:2.59
- NEW ZEALAND
 - Fire service operation and code development, 96:3.43
- NEWARK, N. J.
 - Fatal electrical generating plant fire, Dec. 25, 1992, 93:2.44
- NEWTON, MASSACHUSETTS

NFPA Journal
10 Year Index 1987-1997

- Metals processing plant fire, Oct. 25, 1993, 94:6.63
NFPA. *See also* FIRE SAFETY EDUCATION
100th anniversary supplements, 95:3.83, 95:4.68, 95:5.81
Association plans for its second century, 96:3.57
Board of Directors new member profiles, 95:3.122, 96:3.108
Board of Directors view of future of fire protection, 92:1.47
Center for High-Risk Outreach and Navajo Nation cooperate for fire safety, 97:2.74
Commitment to Learn Not to Burn programs, 93:4.4
Defining NFPA's mission for year 2000, 94:5.4
Fall meeting preview
1991, 91:5.79
1992, 92:5.73
1993, 93:5.75
1994, 94:5.77
1995, 95:5.122
1997, 97:5.85
1998, 98:5.92
Financial report
1992, 93:5.42
1993, 94:4.47
1994, 95:3.115
1995, 96:3.120
Fire Inspector Certification program, 91:3.57
Fire Inspector I Certification Program introduced, 98:3.116
Fire Protection Handbook, 17th edition, overview, 91:3.106
Fire Protection Handbook, 18th edition, overview, 97:1.66
Fire Safety Exhibit, 1993, 93:3.98
Fire service training seminars introduced at 1997 Fall Meeting, 98:2.64
Fire Technology and *Fire Journal* publications, 96:1.67
First NFPA public service announcement campaign, 1950, 95:6.74
Foam Technical Committee report on foam and environment, 95:3.67
Founders of NFPA, 95:3.97
General manager Percy Bugbee's fire safety efforts, 95:6.77
"Great Escape" promotes home fire drills and escape plans, 98:3.74, 4.32
International outreach by the organization, 96:2.69
Long-range plan developed by Board of Directors, 93:3.4
Member Advisory Council, 93:2.78
Membership campaign, 1990-91, 91:1.33
Metropolitan Fire Chiefs section proposed, 96:4.33
Miller, George D., selected as new president, 92:3.4
National Fire Protection Research Foundation and Center for High-Risk Outreach support NFPA mission, 96:2.65
NFPA joins fight against smoking, 94:4.4
100th anniversary supplements, 96:1.65, 96:2.63
Organization must balance tradition, transition, 94:6.4
Rail Transportation Systems, rail fires survey, 91:1.101
Risk Watch addresses eight preventable injuries most threatening to children, 97:4.33
Risk Watch curriculum goals, implementation, and evaluation, 98:5.84
Risk Watch demonstrates value of team work for fire safety, 98:2.30
Risk Watch is useful tool as fire service's mission expands, 98:6.32
Risk Watch's injury prevention curriculum teaches safe fun, 97:5.58
Service to members, editorial, 91:1.5
U. S. fire departments, survey, 93:4.59
Wildland Fire Management Section survey, 92:1.74, 92:2.66, 92:5.96

NFPA Journal
10 Year Index 1987-1997

- NFPA ANNUAL MEETING, NINETY-FIFTH
Highlights of 1991 meeting, 91:4.73
Preview, 91:2.83
- NFPA ANNUAL MEETING, NINETY-SIXTH
Highlights of 1992 meeting, 92:4.74
Preview, 92:2.49
- NFPA ANNUAL MEETING, NINETY-SEVENTH
Highlights of 1993 meeting, 93:4.64
Preview, 93:2.51
- NFPA ANNUAL MEETING, NINETY-EIGHTH
Highlights of 1994 meeting, 94:4.71
Preview, 94:2.71
- NFPA ANNUAL MEETING, NINETY-NINTH
Highlights of 1995 meeting, 95:4.94
Preview, 95, 95:2.75
- NFPA ANNUAL MEETING, ONE HUNDREDTH
Highlights of 1996 meeting, 96:4.90
Preview, 96:1.73, 96:2.73, 96:3.103
- NFPA ANNUAL MEETING, ONE HUNDREDTH FIRST
Annual meeting documents, 97:2.96
- NFPA ANNUAL MEETING, ONE HUNDRED SECOND
Annual meeting documents, 98:2.75
- NFPA CODES AND STANDARDS. *See also* LIFE SAFETY CODE; NATIONAL ELECTRICAL CODE
- Alliances bring codes/standards to Spanish- and Portuguese-speaking world, 96:5.36
 - Annual meeting documents, 1997, 97:2.96
 - Annual meeting documents, 1998, 98:2.75
 - Asian countries encouraged to recognize codes, standards, 97:1.38
 - Consensus process central to NFPA code development, 96:1.42
 - Consensus requirement can slow adoption of innovations, 96:2.29
 - Elevator recall and shut down requirements increase safety, 97:5.64
 - Fall meeting documents, 1997, 97:5.85
 - Federal agencies slow to update regulatory references to NFPA standards, despite Technology Transfer Act, 97:6.29
 - Federal law requires agencies to use voluntary consensus standards, 96:6.40
 - Fire apparatus standards, development of, 92:2.41
 - Fire service role in code-making, 96:1.27
 - General questions answered, 96:3.44
 - Hazardous materials classification and containment issues, 96:2.30
 - Hazardous materials response, 92:1.45
 - Hazardous materials response standards 472, 473, development of, 91:2.110
 - High-rise building requirements address fire risk concerns, 97:6.84
 - High-rise building standards useful worldwide, 96:2.36
 - High-rise buildings, standards for, 92:1.12
 - History of first standard, 95:4.68
 - ICC and NFPA collaborate to develop one national model fire code, 97:4.36
 - Importance of standards to fire service, 92:3.36
 - International Code Council/NFPA collaboration on national fire code, 96:5.46
 - International use of codes and standards, 96:3.66
 - Listing of codes and standards being updated, 96:5.120
 - Model building codes, 92:3.42
 - NFPA 1, *Fire Prevention Code*, development and use as national model code, 96:1.38
 - NFPA 1, *Fire Prevention Code*, questions answered, 98:2.22
 - NFPA 1, *Fire Prevention Code*, revision and adoption by communities, 96:5.46

NFPA Journal
10 Year Index 1987-1997

- NFPA 1, *Fire Prevention Code*, use with existing regulations, 96:3.97
NFPA 1, *Fire Prevention Code*, users like open consensus codes/standards process, 98:4.40
NFPA 10, *Portable Fire Extinguishers*, 1997 edition, 97:5.85
NFPA 10, *Portable Fire Extinguishers*, common questions answered, 96:4.28
NFPA 11A, *Medium- and High-Expansion Foam Systems*, fall meeting review, 98:5.92
NFPA 13, *Installation of Sprinkler Systems*, 1991 edition overview, 91:5.12
NFPA 13, *Installation of Sprinkler Systems*, 1994, changes in, 94:3.14
NFPA 13, *Installation of Sprinkler Systems*, all sprinkler requirements to be centralized in, 98:1.26
NFPA 13, *Installation of Sprinkler Systems*, changes in 1996 edition, 97:1.34
NFPA 13, *Installation of Sprinkler Systems*, questions answered, 97:5.27
NFPA 25, *Water-Based Fire Protection Systems*, 1997 edition, 97:5.85
NFPA 30, *Flammable and Combustible Liquids* requirements for service station design, 98:4.76
NFPA 30A, *Automotive and Marine Service Station* requirements for station design, 98:4.76
NFPA 51B, *Fire Prevention During Welding, Cutting, and Other Hot Work*, fall meeting review, 98:5.92
NFPA 58, *Liquefied Petroleum Gases*, 1997 edition, 97:5.86
NFPA 70, *National Electrical Code* (See NATIONAL ELECTRICAL CODE)
NFPA 72, *Protective Signaling Systems*, combines previous standards, 91:5.86
NFPA 72, *The National Fire Alarm Code*, 1996 edition, questions answered, 97:4.25
NFPA 72, *The National Fire Alarm Code*, and UL standards work together, 93:5.25
NFPA 72, *The National Fire Alarm Code*, consolidates signaling standards, 93:5.70
NFPA 72, *The National Fire Alarm Code*, requirements for safe elevator recall, 93:3.28
NFPA 80, *Fire Doors and Fire Windows*, fall meeting review, 98:5.92
NFPA 80, *Fire Doors and Windows*, modifications to fire doors under, 92:6.12
NFPA 91, *Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*, fall meeting review, 98:5.92
NFPA 96, *Ventilation Control and Fire Protection of Commercial Cooking Operations*, common questions answered, 97:1.33
NFPA 99, *Health Care Facilities*, common questions answered, 96:6.28
NFPA 101 (See LIFE SAFETY CODE)
NFPA 101, *Life Safety Code* (See LIFE SAFETY CODE)
NFPA 101A, *Alternative Approaches to Life Safety*, Fire Safety Evaluation System, 95:6.22
NFPA 101B, *Means of Egress for Buildings and Structures*, fall meeting review, 98:5.92
NFPA 101B, *Means of Egress for Buildings and Structures*, new document scheduled for 1998 NFPA Fall Meeting, 98:1.28
NFPA 130, *Fixed Guideway Systems*, 1997 edition, 97:2.96
NFPA 160, *Flame Special Effects Before a Proximate Audience*, 1997 edition, 97:5.86
NFPA 204M, *Guide for Smoke and Heat Venting*, 1997 edition, 97:2.96
NFPA 232A, *Guide for Fire Protection for Archives and Records Centers* may need updating for larger facilities, 98:2.68
NFPA 266, *Fire Characteristics of Upholstered Furniture Exposed to Flaming Ignition*, 1997 edition, 97:5.86
NFPA 267, *Fire Characteristics of Mattresses and Bedding Assemblies Exposed to Flaming Ignition Source*, 1997 edition, 97:5.86
NFPA 295, *Wildfire Control*, current edition, 98:2.44
NFPA 299, *Protection of Life and Property from Wildfire*, 1997 edition, 97:2.96
NFPA 299, *Protection of Life and Property from Wildfires* considered for adoption by Ormond Beach, Florida, fire authorities, 98:6.99

NFPA Journal
10 Year Index 1987-1997

- NFPA 306, *Control of Gas Hazards on Vessels*, 1997 edition, represents 75 years of marine fire protection, 97:2.90
- NFPA 402, *Manual for Aircraft Rescue and Fire Fighting Operations*, international use, 96:3.50
- NFPA 415, *Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*, questions answered, 98:4.24
- NFPA 497A, *Classification of Class I Hazardous Locations for Electrical Installations in Chemical Process Areas*, 1997 edition, 97:2.97
- NFPA 600, *Private Fire Brigades*, 92:2.41
- NFPA 720, *Recommended Practice for Installation of Household Carbon Monoxide Warning Equipment* questions answered, 98:5.20
- NFPA 720, *Recommended Practice for the Installation of Household Carbon Monoxide Warning Equipment*, 1997 edition, 97:5.86
- NFPA 801, *Fire Protection for Facilities Handling Radioactive Materials*, 1997 edition, 97:5.86
- NFPA 803, *Fire Protection for Light Water Nuclear Power Plants*, 1997 edition, 97:5.88
- NFPA 820, *Fire Protection in Wastewater Treatment Plants*, development of, 91:1.44
- NFPA 909, *Protection of Cultural Resources*, 1997 edition, 97:2.97
- NFPA 921, *Fire and Explosion Investigations*, 1997 edition, 97:5.88
- NFPA 921, *Guide to Fire and Explosion Investigations*, as authoritative treatise for litigation, 96:2.40
- NFPA 1001, *Fire Fighter Professional Qualifications*, 1997 edition, 97:2.99
- NFPA 1021, *Fire Officer Professional Qualifications*, 1997 edition, 97:2.99
- NFPA 1051, *Wildland Fire Fighter Professional Qualifications*, approved, 95:5.39
- NFPA 1123 and 1124, fireworks codes, questions answered, 98:3.44
- NFPA 1200, *Organization, Operation, Deployment, and Evaluation of Public Fire Protection and Emergency Medical Services*, fall meeting discussion, 97:5.88
- NFPA 1231, *Water Supplies for Suburban and Rural Fire Fighting*, current edition, 98:2.44
- NFPA 1500, *Fire Department Occupational Safety and Health Program*, 1997 edition, 97:2.99, 4.74
- NFPA 1500, *Fire Department Occupational Safety and Health Program*, minimum staffing issue, 92:4.96
- NFPA 1582, *Medical Requirements for Fire Fighters*, 1997 edition, 97:2.99
- NFPA 1600, *Disaster Management*, 95:4.49
- NFPA 1911, *Service Tests of Pumps on Fire Department Apparatus*, 1997 edition, 97:2.99
- NFPA 1914, *Testing Fire Department Aerial Devices*, 1997 edition, 97:2.99
- NFPA 1971, *Protective Ensemble for Structural Fire Fighting*, 1997 edition, consolidates testing, performance requirements for structural fire fighting ensemble, 97:6.62
- NFPA 1999, *Protective Clothing for Emergency Medical Operations*, 1997 edition, 97:2.99
- Performance-based code development, 95:2.16, 96:1.46
- Performance-based codes based on existing codes, 95:3.24
- Re-engineering the codes-and standards-making process, 98:1.68
- Regional fire code development committees provide input to NFPA, 96:6.27
- Relationship to international standards, 94:1.36
- Spanish language codes and standards, 96:1.34, 96:4.34
- Sprinkler systems, codes addressing, 97:5.27
- Standards Council's history, 95:5.89
- Voting procedures for NFPA consensus standards, 92:6.4
- Water mist suppression standard under development, 94:3.53
- Wildfire personnel qualifications, 94:1.33
- NFPA FILMS

NFPA Journal
10 Year Index 1987-1997

Senior fire safety with Jonathan Winters, 91:2.44

NIGHT CLUB FIRES

Beverly Hills Supper Club, Southgate, Kentucky, May 28, 1977, 96:2.63

Cocoanut Grove, Boston, Mass., Nov. 28, 1942, 91:3.74

Texas, 1991, 92:6.25

9-1-1 SERVICE

Federal Communications Commission (FCC) establishes 311 non-emergency number,
97:4.29

9-1-1 SERVICE

E911 fails in telephone exchange fire, 95:5.109

NORSTROM, GAIL P.

Profile of, 97:5.38

NORTH CAROLINA

Aircraft fire, June, 1994, 95:6.110

Catastrophic fires

Aircraft, March 23, 1994, 95:5.67

Aircraft, July 2, 1994, 95:5.68

Apartment building, Sept. 5, 1993, 94:5.100

Board and care facility, March 17, 1996, 97:5.52

Dwelling, Nov. 13, 1992, 93:5.64

Dwelling, Feb. 28, 1994, 95:5.58

Dwelling, Feb. 23, 1996, 97:5.49

Dwelling, Feb. 17, 1997, 98:5.49

Fraternity house, May 12, 1996, 97:5.50

Manufacturing plant, Sept. 3, 1991, 92:1.29, 92:4.70

Condominium complex fire, Sept., 1993, 94:6.90

Detention facility fire, 1996, 97:1.27

Fatal fires

Aircraft, July, 1994, 95:6.110

Apartment building, 1994, 95:4.38, 95:5.34

Board and care facility, March 17, 1996, fire investigation report, 98:5.37

College building, May 12, 1996, 96:5.61

Dwelling, 1994, 95:1.34

Manufactured home, 1991, 92:2.28

Manufactured home, 1997, 98:2.16

Manufacturing plant fire, 1989, 91:3.29

Manufacturing plant fire, 1992, 93:5.37

Manufacturing plant fire, May, 1992, 93:6.84

Manufacturing plant fires, 1994, 95:2.32, 95:3.40

Manufacturing plant fires, Oct., 1994, 95:6.103

Manufacturing plant fire, 1995, 96:3.39, 96:4.24

Manufacturing plant fire, 1996, 97:3.33

Mill fire, 1991, 92:5.30

Store fire, 1997, 98:6.22

Warehouse fire, 1992, 93:2.21

Warehouse fire, April, 1992, 93:6.87

Warehouse fire, 1994, 95:6.38

Warehouse fire, Aug. 12, 1997, 98:6.88

Warehouse fire, Sep. 29, 1997, 98:6.87

NORTH DAKOTA

Catastrophic dwelling fire, Oct. 7, 1994, 95:5.53

Fatal manufactured home fire, 1995, 96:2.23

Office building fire, April 19, 1997, 98:6.88

Restaurant fire, 1993, 94:3.28

NFPA Journal
10 Year Index 1987-1997

- Storage facility fire, 1993, 94:1.30
- NORTHRIDGE, CALIF. EARTHQUAKE
 - Relief agencies pick up pieces, 95:3.52
- NOVA SCOTIA, CANADA
 - Munitions ship explosion, Dec. 6, 1917, 92:3.96
 - School fire, 1991, 92:5.30
- NUCLEAR ENERGY PLANT FIRES
 - Alabama, May 23, 1996, 97:6.58
 - Illinois, April, 1994, 95:6.102
- NURSING HOME FIRES
 - Arizona, 1993, 94:4.29
 - Catastrophic
 - Arkansas, March 13, 1990, 91:4.67
 - Mississippi, Apr. 9, 1995, 96:5.96
 - Illinois, 1997, 98:1.24
 - Knox County, Tenn., April 25, 1994, 95:2.85
 - Massachusetts, 1991, 92:2.26
 - Massachusetts, Oct. 30, 1992, 93:5.49
 - Massachusetts, 1994, 95:5.33
 - Massachusetts, 1995, 96:2.25
 - Massachusetts, 1997, 98:5.17
 - Michigan, 1990, 91:4.25
 - New Hampshire, 1991, 92:6.29
 - Overview, 1982-1987, 91:2.42
 - Utah, 1991, 92:4.27
 - Washington, 1995, 96:4.24
- O
- OBSERVATORY FIRES
 - Catastrophic, Hawaii, Jan. 16, 1996, 97:5.52, 6.59
- OCCUPANCY CLASSIFICATIONS
 - Uses of, and alternatives to, 97:5.28
- OCCUPANT LOAD
 - Evaluating occupant load for egress, 94:1.14
 - Myths of occupant load calculation, 96:6.30
- OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)
 - Confined space incidents target of new regulation, 94:5.80
 - Fire safety review urged, 92:1.34
- OFFICE BUILDINGS
 - Renovations can lead to code-compliance problems, 97:4.26
- OFFICE BUILDING FIRES. *See also* HIGH-RISE BUILDING FIRES
 - California, 1991, 92:1.23
 - California, March, 1991, 92:6.78
 - California, 1993, 94:5.30
 - California, 1994, 95:5.35
 - California, 1995, 96:1.21
 - Catastrophic
 - Georgia, Jan. 12, 1995, 96:5.100
 - New York, Feb. 26, 1993 (World Trade Center), 93:6.91, 94:5.104, 94:6.90, 95:2.59
 - Oklahoma, Apr. 19, 1995, 95:4.51, 96:1.50, 96:1.59, 96:5.94, 96:6.69
 - Pennsylvania, Feb. 23, 1991, 92:4.71
 - Colorado, Sept. 28, 1992, 93:2.33
 - Georgia, Aug., 1995, 96:6.73
 - Georgia, Jan. 12, 1997, 97:3.52

NFPA Journal
10 Year Index 1987-1997

Hawaii, July, 1993, 94:6.91
Indiana, July 16, 1996, 97:6.53
Iowa, 1992, 93:1.26
Los Angeles, Calif., May 4, 1988, 92:5.56
Los Angeles, Calif., Feb. 15, 1992, 92:5.56
Massachusetts, 1991, 92:5.28
Massachusetts, 1995, 96:2.24
Michigan, Aug. 4, 1996, 97:6.53
Modern office environments increase fire hazards, 92:5.56
New York, Aug., 1994, 95:6.100
New York, 1996, 97:6.22
North Dakota, April 19, 1997, 98:6.88
Oklahoma, Jan., 1994, 95:6.98
Pennsylvania, Feb., 1991, 92:6.74
Philadelphia, Pa., Feb. 23, 1991, 91:5.64, 92:5.56
Texas, Oct., 1994, 95:6.99
Utah, 1990, 91:2.30
Utah, 1994, 95:3.40
Virginia, 1991, 92:2.25
Virginia, April, 1995, 96:6.63
Washington, 1993, 94:2.29
Washington, D. C., U. S. Treasury Building fire, June 26, 1996, 96:6.52, 97:6.53
West Virginia, March, 1995, 96:6.70
Wisconsin, 1996, 97:2.23
World Trade Center, N. Y., evacuation behavior, 95:2.59

OHIO

Apartment building fire, 1993, 94:2.29
Apartment building fire, 1995, 96:5.24
Apartment complex and boat fire, March, 1992, 93:6.81
Building-under-construction fire, March, 1994, 95:6.110
Catastrophic fires
 Apartment building, Dec. 11, 1993, 94:5.102
 Apartment building, Jan. 12, 1994, 95:5.58
 Automobile repair shop, Nov. 11, 1991, 92:4.70
 Boat, May 9, 1993, 94:5.106
 Camping trailer, Nov. 29, 1997, 98:5.56
 Dwelling, Oct. 21, 1990, 91:4.66
 Dwelling, Dec. 25, 1990, 91:4.66
 Dwelling, Dec. 15, 1991, 92:4.69
 Dwelling, Jan. 26, 1992, 93:5.62
 Dwelling, Feb. 14, 1993, 94:5.98
 Dwelling, Dec. 22, 1993, 94:5.96
 Dwelling, Jan. 26, 1994, 95:5.56
 Dwelling, Dec. 28, 1995, 96:5.91
 Limited care facility, Dec. 5, 1990, 91:4.69
 Manufactured home, Nov. 17, 1996, 97:5.51
 Manufacturing plant explosion, April 20, 1994, 95:5.64
 Manufacturing plant, May 27, 1994, 95:5.66
 Oil well, Oct. 10, 1991, 92:4.71
 Rooming house, Feb. 18, 1991, 92:4.67
 Store, July 3, 1996, 97:5.52
 Truck, Dec. 4, 1992, 93:5.68
Church fire, 1994, 95:3.39
Crown Coliseum, Cincinnati, updates fire protection system, 98:3.120

NFPA Journal
10 Year Index 1987-1997

Detention facility fire, April 21, 1930, 94:5.54

Fatal fires

Aircraft, Jan., 1994, 95:6.110

Apartment building, 1996, 97:4.20

Camping trailer, 1996, 97:6.20

College building, 1996, 97:6.21

Dwelling, 1992, 93:2.22, 93:5.36, 93:6.28

Dwelling, 1993, 94:1.31, 94:5.28

Dwelling, 1996, 97:5.21, 6.19

Fireworks explosion, 1989, 91:1.31

Hospital, 1994, 95:2.31

Gas distribution facility fire, 1996, 97:4.20

Hotel fire, 1996, 97:6.19

Lumber store fire, 1989, 91:1.28

Manufactured home fire, 1997, 98:3.38

Manufacturing plant fire, 1990, 91:3.31

Manufacturing plant fire, July 19, 1990, 91:6.74

Manufacturing plant fire, June, 1992, 93:6.84

Manufacturing plant fire, 1993, 94:5.29

Manufacturing plant fire, 1994, 95:6.37

Manufacturing plant fires, Oct., 1994, 95:6.103, 104

Manufacturing plant fire, Jan., 1995, 96:6.65

Manufacturing plant fire, March, 1995, 96:6.63

Manufacturing plant fire, 1996, 97:5.24

Manufacturing plant fire, June 16, 1996, 97:6.52

Manufacturing plant fire, Sept. 13, 1996, 97:6.52

Manufacturing plant fire, Oct. 12, 1996, 97:6.49

Manufacturing plant fire, Nov. 1, 1996, 97:6.49

Manufacturing plant fire, Aug. 14, 1997, 98:6.84

Restaurant fire, 1995, 96:3.35

Restaurant fire, 1997, 98:6.21

Storage facility fire, 1993, 94:2.27

Store fire, Nov. 13, 1996, 97:6.54

OHIO STATE PENITENTIARY FIRE

Columbus, Ohio, April 21, 1930, 95:5.84

OIL

Contaminated waste oil ignited by smoking materials, 96:3.40

Cooking oil

Overheats, ignites, 92:4.26, 93:1.27, 93:4.25, 93:5.35, 36, 96:6.22, 98:5.15, 49

Coolant oil ignites, fuels fire, 94:6.94

Crude oil

Cigarette lighter, ignited by, 91:4.69

Open flame, ignited by, 91:4.68

Sprayed onto furnace, ignites, 96:6.63

Vapors ignited by cigarette lighter, 94:5.104

Vapors ignited in catastrophic fire, 96:5.97

Cutting oil, ignited by hot metal, 98:6.84

Finishing oil ignited by friction sparks, 93:6.82

Floor saturated with, increased fire spread, 94:6.98

Hot pressurized oil atomizes, ignites oil residue, 96:6.62

Hydraulic oil

Leak, ignited by electric motor, 97:3.33

Natural gas burners, ignited by, 92:1.29, 92:4.70

Overheated transformer, ignited by, 96:5.26

NFPA Journal
10 Year Index 1987-1997

- Residue factor in fire spread, 92:3.32
- Sprayed onto furnace ignites gas, 94:3.29
- Sprayed onto space heater, ignites, 95:6.102
- Leaking oil atomized, ignites, possible fire cause, 95:6.103
- Leaking oil ignited by furnace, 97:6.49
- Lubricating oil
 - Deposits ignited by molten glass, 93:6.27
 - Fire spread, ignited by, 93:6.85
 - Leaks, fuels fire, 94:6.92
 - Power plant fire, ignited in, 95:6.100
 - Spray from failed pipe ignites and explodes, 93:2.44, 93:5.67, 93:6.82
- No. 2 fuel oil, leaked, ignites, 95:1.33
- No. 6 fuel oil
 - Fire fueled by, 93:6.86
 - Leaked, ignites, 93:6.82
 - From ruptured line ignited by burners, 96:6.72
- Oil on compressor ignited by heat, 95:3.40
- Oil on electrical cord ignited by spark, 93:5.37
- Overheated oil in transformer explodes, ignites, 94:6.92
- Petroleum products manufacturing and distribution facility fire, 97:2.24
- Rags impregnated with linseed oil ignite, 93:6.79
- Rags soaked with ignite, 98:6.21
- Superheated oil and water cause steam explosion, catastrophic fire, 92:4.70
- OIL REFINERY FIRES. See REFINERIES, OIL, FIRES**
- OIL WELL FIRES**
 - Catastrophic, Louisiana, June 16, 1997, 98:5.53
 - Catastrophic, Ohio, Oct. 10, 1991, 92:4.71
- OKLAHOMA**
 - Catastrophic fires
 - Aircraft, Aug. 21, 1990, 91:4.70
 - Aircraft, Dec. 21, 1995, 96:5.99
 - Apartment building, Feb. 5, 1997, 98:5.49
 - Dwelling, Feb. 1, 1991, 92:4.68
 - Dwelling, Aug. 31, 1991, 92:4.69
 - Dwelling, Sept. 21, 1993, 94:5.100
 - Dwelling, Nov. 20, 1994, 95:5.62
 - Manufactured home, Apr. 20, 1996, 97:5.49
 - Office building, Apr. 19, 1995, 95:4.51, 96:1.50, 96:1.59, 96:5.94, 96:6.69
 - Storage tank facility, May 16, 1990, 91:4.69
 - Tank storage facilities, Apr. 23, 1995, 96:5.97
 - Fatal fires
 - Dwelling, 1991, 92:6.28
 - Dwelling, 1996, 97:3.29
 - Dwelling, 1997, 98:3.38
 - Grass/warehouse fire, 1990, 91:4.26
 - Manufacturing plant fire, 1992, 93:5.37
 - Office building fire, June, 1994, 95:6.98
 - Vehicle fire, 1996, 97:3.33
- OKLAHOMA CITY, OKLA.**
 - Alfred P. Murrah Federal Building bombing and fire, April 19, 1995, 95:4.51, 96:5.94, 96:6.69
 - Alfred P. Murrah Federal Building fire, Apr. 19, 1995, NFPA documentation of response, 96:1.50
 - USAR task force response to Murrah Federal Building bombing, 96:1.59

NFPA Journal
10 Year Index 1987-1997

OLIVER, DAVID

Profile of, 97:4.35

ONG, Y. S.

Profile of, 97:6.36

ONTARIO, CANADA

Fatal board and care facility fire, March 21, 1995, fire investigation report, 98:5.38

Hospital fire, 1992, 93:2.20

Manufacturing plant/laboratory fire, 1992, 93:6.27

Motor vehicle repair shop fire, 1989, 91:1.28

Tire fire, 1990, 91:1.50

OPEN FLAME DEVICES

Catastrophic incendiary fire ignited by, 98:5.45, 46

Child playing with charcoal lighter, ignites fatal fire, 98:4.19

Children use gas grill/pilot lighter to ignite cushions in store fire, 98:4.49

Incendiary fire ignited by, 98:6.22

OPENINGS. *See also* STAIRWAYS

Fire spread through, 94:6.93, 95:5.33, 95:6.104, 98:6.86, 92

In fire wall, fire spread through, 98:6.92

Through-penetration protection systems, 94:1.54

Unprotected

Store fire, factor in, 92:6.78

Warehouse fire, factor in, 93:6.86

ORANGE COUNTY, FLA.

Orange County Fire and Rescue Service operates as a consolidated force, 93:2.63

OREGON

Apartment building fire, 1996, 97:3.30

Catastrophic fires

Apartment building, June 28, 1996, 97:5.49

Board and care facility, Jan. 12, 1995, 96:5.96

Motor vehicle, March 25, 1997, 98:5.55

Fatal wildland/urban interface fire, Aug., 1994, 95:6.111

Manufacturing plant fire, Feb. 19, 1990, 91:6.75

Manufacturing plant fire, July, 1992, 93:6.84

Manufacturing plant fire, 1993, 94:3.29

Manufacturing plant fire, July, 1995, 96:6.64

Manufacturing plant fire, Nov. 18, 1996, 97:6.50

Museum fire, 1994, 95:6.35

School fire, 1991, 92:2.25

School fire, 1993, 94:5.28

Store fire, 1996, 97:3.33

Warehouse fire, 1993, 94:3.27

Wildland fire, Oct., 1991, 92:6.76

Wildland fire, Aug., 1992, 93:6.89

ORLANDO, FLA.

Disney World fire protection systems, 96:3.119

Orlando Fire Department offers innovative service to tourist center, 93:2.59

O'SULLIVAN, JOHN J.

Profile of, 97:1.42

OUR LADY OF THE ANGELS SCHOOL FIRE

Arson fire, Chicago, IL, 1958, 96:1.72

OUTREACH COLUMNS

College students need fire safety education, 97:5.34

Fire drills: The Great Escape, theme of Fire Prevention Week 1998, 98:4.32

Fire safety education benefits from teamwork, including *Risk Watch*, 98:2.30

NFPA Journal
10 Year Index 1987-1997

NFPA Champion Award Program discourages juvenile firesetting, 97:2.34
NFPA Champion Award Program provides age-appropriate fire safety education,
97:3.45
NFPA members should use their expertise to be safety role models, 97:6.32
NFPA *Risk Watch* addresses eight preventable injuries most threatening to children,
97:4.33
Residential sprinklers discussed on television talk show, 98:3.52
Teachers as leaders in fire/life safety education, 98:1.34
Thanks to those who support fire safety education and need for more assistance, 98:6.34
U. S. society needs to shift focus from fire response to prevention, 98:5.28

OVENS, DRYING

Dust and lacquer in vent system, ignited by heat source, 96:4.24

OXYGEN

Fuels hospital fire, 94:5.104
Generators in cargo hold possibly activated, ignited catastrophic aircraft fire, 97:5.54
Oxygen-enriched atmosphere and oxygen container failure fuel fatal fire, 98:4.19
Oxygen-enriched atmosphere fueled aircraft fire, 92:6.76
Oxygen-enriched atmosphere in operating room intensifies fire, 98:5.17
Smoking, ignited by
Apartment fire, 91:2.29
Board and care facility fire; stored oxygen, 96:5.96
Nursing home fire, 92:2.26

OZONE

Second International Conference, 1990, 91:1.64

P

PAINT MANUFACTURING PLANT FIRES

California, 1991, 92:4.28

PAPER

Cardboard ignited by forging equipment, 97:6.52
Government building fire, used to ignite, 92:6.26
Incendiary fire started in shredded paper, 94:6.97
Incendiary fire started with paper products, 96:1.24
Rolled
Electrical malfunction, ignited by, 96:6.62
Paper mill fire fueled by, 94:6.34
Printing plant fire fueled by, 96:6.63
Warehouse fire fueled by, 97:6.56
Scrap paper jams forklift, ignites fire, 94:6.95
Stored
Fire fueled by, 94:6.95
Light, ignited by, 94:6.94
Warehouse destroyed by fire, 96:1.24

PARRY, GEORGE T.

Profile of, 97:2.36

PARSONS, DAVIS R.

Profile of, 97:1.41

PASSIVE FIRE PROTECTION

Value in fire control, 97:2.30

PENDERGRAS, DOUGLAS G.

Profile of, 98:6.36

PENNSYLVANIA

Board and care facility fire, 1993, 94:6.33
Board and care facility fire, May 4, 1997, analysis, 97:5.68
Building-under-renovation fire, 1997, 98:6.24

NFPA Journal
10 Year Index 1987-1997

Catastrophic fires

- Apartment building, April 5, 1997, 98:5.45
- Automobile, Nov. 8, 1992, 93:5.68
- Board and care facility, Aug. 20, 1996, 97:5.52
- Board-and-care facility, May 14, 1997, 98:5.53
- Dwelling, March 3, 1990, 91:4.64
- Dwelling, July 30, 1990, 91:4.66
- Dwelling, Feb. 14, 1991, 92:4.67
- Dwelling, Dec. 14, 1991, 92:4.69
- Dwelling, March 13, 1992, 93:5.62
- Dwelling, July 24, 1992, 93:5.62
- Dwelling, Oct. 2, 1992, 93:5.64
- Dwelling, Dec. 5, 1992, 93:5.62
- Dwelling, July 25, 1993, 94:5.97
- Dwelling, April 6, 1994, 95:5.59
- Dwelling, Oct. 21, 1994, 95:5.60
- Dwelling, Dec. 23, 1994, 95:5.58
- Dwelling, Feb. 12, 1995, 96:5.92
- Dwelling, May 24, 1997, 98:5.49
- Dwelling, May 25, 1997, 98:5.46
- Dwelling, Oct. 24, 1997, 98:5.50
- Furniture refinishing plant, Dec. 20, 1991, 92:3.73
- High-rise office building, Feb. 23, 1991, 92:4.71
- Manufacturing plant, May 15, 1991, 92:4.71
- Manufacturing plant, Dec. 20, 1991, 92:4.71
- Oil refinery, Oct. 16, 1995, 96:5.96
- Shanty, 91:4.69
- Vacant dwelling fire, Aug. 1, 1992, 93:5.67
- Church fire, Feb., 1995, 96:6.73
- Church fire, Sep. 11, 1997, 98:6.92
- Community center fire, 1996, 97:5.23
- Detention facility fire, 1994, 95:5.33
- Dormitory fire, April, 1994, 95:6.99
- Dwelling fire, 1996, 97:4.19
- Dwelling fire, 1997, 98:1.22, 98:3.38
- Dwelling-under-construction fire, 1995, 96:6.23
- Fatal fires
 - Apartment building, 1990, 91:4.26
 - Board and care facility, May 13, 1997, fire investigation report, 98:5.37
 - College building, 1992, 93:1.27
 - Dwelling, 1994, 95:1.34
 - Dwelling, 1997, 98:1.23
 - High-rise office building fire, Feb. 23, 1991, 91:5.64, 92:5.56, 92:6.74
 - Furniture manufacturing plant fire, 1992, 93:1.28
 - Historic mansion fire, 1993, 94:4.31
 - Hospital fire, 1991, 92:2.27
 - Manufacturing plant fire, 1990, 91:5.28
 - Manufacturing plant fire, Feb., 1993, 94:6.95
 - Manufacturing plant fire, Dec., 1993, 94:6.95
 - Manufacturing plant fire, Jan. 31, 1997, 98:6.85
 - Manufacturing plant fire, July 4, 1997, 98:6.86
 - Manufacturing plant fire, Sept. 5, 1997, 98:6.84
 - Manufacturing plant/warehouse fire, June, 1991, 92:6.80
 - Public entertainment center fire, Jan. 28, 1997, 98:6.92

NFPA Journal
10 Year Index 1987-1997

- Research laboratory fire, 1991, 92:4.25
- School fire, 1996, 97:3.34
- Shopping mall fire, 1996, 97:6.21
- Shopping mall fire, Dec., 1994, 95:6.99
- Storage facility fire, May 5, 1997, 98:6.91
- Store fires, 1992, 93:3.36, 93:6.29
- Store fire, 1993, 94:6.35
- Store fire, Dec., 1994, 95:6.99
- Store fire, Dec. 21, 1997, 98:6.89
- Subway car fire, 1990, 91:4.31
- Tank farm fire, Oct., 1995, 96:6.62
- Tire fire, March 13, 1996, 97:6.59
- Warehouse fire, 1991, 92:2.27
- Warehouse fire, August, 1992, 93:6.85
- Warehouse fire, Aug. 27, 1996, 97:6.56
- Zoo fire, 1995, 96:6.24
- PERSONAL PROTECTIVE EQUIPMENT**
 - Firefighter fatalities wearing PASS devices, ten year analysis, 98:4.56
 - Improved thermal protection increases heat stress, 93:6.17
 - Performance in wildland fire, 95:5.67
- PESHTIGO, WIS.**
 - Wildland/urban interface fire, 1871, 94:2.86
- PETERSON, WILLIAM E.**
 - Profile of, 91:4.12
- PHILADELPHIA, PA.**
 - High-rise office building fire, Feb. 23, 1991, 92:5.56
- PIER AND WHARF FIRES**
 - Louisiana, Aug. 24, 1990, 91:6.73
 - New York, Feb. 12, 1997, 98:5.53
- PILIERO, DANIEL J.**
 - Memorial tribute, 91:2.35
- PLASTICS FIRES**
 - Acrylic sheet ignited by malfunctioning form machine, 97:4.22
 - Embers ignite polyurethane, 95:3.38
 - Fan motor overheats, ignites plastic trim, 95:5.33
 - Heat lamps ignite plastic trays in restaurant fire, 96:3.36
 - Insulation ignited by electric box malfunction, 96:3.40
 - Plastic pellets ignited, 95:6.103
 - Rigid plastic insulation, ignited in incendiary fire, 95:6.104
 - Torch ignites residual plastic in shredder, 96:5.23
 - Trash container, lined with plastic bag, ignited by cigarettes, 92:4.69
 - Warehouse destroyed by fire, 96:1.24
- POLYCHLORINATED BIPHENYLS (PCBs)**
 - Hazardous materials response at generating plant fire, 94:6.92
 - Transformers, safety of PCBs in, 91:1.116
- POLYURETHANE FOAM. See FOAM RUBBER OR POLYURETHANE; INSULATION**
- PORTLAND, OREGON**
 - Preschoolers learn fire safety in Head Start program, 94:1.67
- POSTAL FACILITY FIRES**
 - Massachusetts, 1990, 91:3.27
- POVERTY. See also HOMELESS**
 - Catastrophic fire, factor in, 97:5.51
 - Fire risk statistics affected by, 96:1.104

NFPA Journal
10 Year Index 1987-1997

- Utilities shut off for nonpayment, fires caused by (*See* UTILITIES)
- POWER PLANT FIRES. *See also* ELECTRIC GENERATING PLANT FIRES
Steam, Virginia, Feb., 1995, 96:6.72
- POWER SAWS
Gasoline-powered saw ignites roof fire, 92:3.31
- PRESCRIBED BURNS
Fire spread beyond containment lines, Texas, 1994, 95:2.31
- PRISON FIRES. *See* DETENTION FACILITY FIRES
- PRODUCT LABELS
Effectiveness of labeling systems for flammable and combustible products, 94:1.71
- PROFILE COLUMNS
Almand, Kathleen H., 98:3.54
Austin, Stephen P., 96:5.38
Bailey, Dan W., 92:1.16
Bathurst, Donald G., 93:6.20
Bell, A. D., 95:5.26
Benarick, Glenn P., 94:1.22
Bernd, Robert E., 98:1.36
Beyreis, James R., 94:5.20
Blair, John A., 91:6.18
Bliss, Donald P., 98:4.36
Boehlert, Sherwood, 96:1.36
Boyd, Howard F., 93:4.18
Boyd, Wayne H., 98:4.39
Brace, Tom, 96:4.37
Brannigan, Frank, 95:1.23
Breedlove, Diane, 94:2.22
Brice, Herman W., 94:3.21
Bruno, Hal, 96:2.38
Bukowski, Richard W., 94:1.23
Carson, Margaret D., 92:2.20
Castino, G. Thomas, 93:3.20
Cox, Phil, 96:4.36
Crawford, Jim, 93:5.23
Daly, Wendy L., 94:3.20
DiNenno, Philip J., 92:4.20
Dungan, Kenneth W., 92:5.20
Ewell, P. Lamont, 95:3.30
Fleming, Joseph M., 98:1.37
Fleming, Russell P., 91:2.14
Forsman, Douglas P., 95:4.30
Gabriele, Rocco J., 95:2.22
Glatfelter, Arthur J., 97:6.35
Gonzales, Richard L., 93:6.21
Goss, Kay, 96:3.53
Grant, Ernest, 96:5.39
Greene, Olin L., 92:3.26
Gross, Carol, 95:3.31
Hathaway, Leonard R., 96:6.38
Hawkins, Jasper Stillwell, 95:2.23
Hewitt, Terry-Dawn, 98:2.32
Hoebel, James F., 97:2.37
Javeri, Sultan M., 97:3.48
Keigher, Donald J., 95:5.27

NFPA Journal
10 Year Index 1987-1997

- Kung, Hsiang-Cheng, 95:4.31
Labauve, Lamar, 96:1.37
Lingenfelter, Gerald, 96:2.39
Lion, Douglas R., 93:2.16
Long, Marian H., 96:6.39
Lopes, Rocky, 95:1.22
Lucht, David A., 93:5.22
Mattern, Jeffrey, 97:4.34
McDaniels, Warren, 98:2.33
Mickalide, Angela D., 98:5.30
Moore, Wayne D., 94:4.23
Moses, Thomas M., 91:1.14
Nachbar, Mary, 94:5.21
Nelson, Harold E., 93:1.21
Nelson, Jennifer L., 93:2.17
Norstrom, Gail P., 97:5.38
Oliver, David, 97:4.35
Ong, Y. S., 97:6.36
O'Sullivan, John J., 97:1.42
Parry, George T., 97:2.36
Parsons, Davis R., 97:1.41
Pendergras, Douglas G., 98:6.36
Peterson, William E., 91:4.12
Proulx, Guylène, 97:3.47
Pullan, Art, 98:3.57
Renfrew, Henry W., 94:4.22
Richardson, Kenneth J., 91:5.20
Sanders, Russell E., 93:1.20
Scannell, Jerry, 96:3.55
Sharry, John, 94:6.26
Simmons, Philip, 94:2.23
Smittle, Walter, III, 92:6.20
Stronach, Ian, 98:5.33
Testa, William L., 94:6.27
Thomas, H. Emerson, 98:6.39
Trench, Nancy J., 93:3.21
Vidal, David J., 93:4.19
Weldon, Curt, 91:3.14
Witzeman, Lou, 97:5.37
- PROPANE. *See also* LP-GAS**
Burner ignites hydrogen, 92:5.28
Cylinder ruptures when overfilled, 94:3.30
Cylinders, improperly stored, fail, release vapor cloud, 98:6.89
Cylinders BLEVE in fire, 91:6.23
Cylinders explode in auto repair shop fire, 95:6.100
Cylinders ignited by spreading fire, 94:6.36
Cylinders leak, BLEVE, 97:3.33
Fire and explosion involving, 91:1.28, 91:3.27
Forklift fuel ignited by engine block, 91:2.33
Gas lines fail, fuel catastrophic fire, 92:4.70
Gas released from cylinder explodes, ignites distribution facility fire, 97:4.20
Grill fuel ignited by open flame, 91:5.26
Grill fuel tank leaks, ignites dwelling fire, 97:4.19
Grill tank fuel, released, contributes to fire spread, 96:4.22

NFPA Journal
10 Year Index 1987-1997

- Grill tank fuel released, ignited by spark, 94:3.28
- Heater, portable, ignites paper, 95:6.35
- Heaters ignite wood sprinkler enclosures, 95:1.32
- Isobutyl propane, ignited by electrical arc, 92:6.28
- Juveniles inhaling propane inadvertently ignite residual gas, 97:6.19
- Space heater ignites gasoline vapors, 97:1.26
- Stove fuel contributes to spread of catastrophic fire, 94:5.96
- Tank explodes, starts fire, 94:1.30
- Tank truck fuel leak ignited by open flame, 93:3.36
- Tank truck leak ignites fatal truck/clubhouse/storage tank fire, 98:2.19
- Tank trucks at fire site hampered fire fighting, 94:6.96
- Tank vents, forcing fire fighters to evacuate building fire, 96:6.73
- Tanks protected in manufacturing plant fire, 94:6.95
- Torch ignites combustible crates and plastic, 91:6.73
- Torch ignites couch, 93:2.22
- Torch ignites fire in roof drain, 97:6.53
- Torch ignites restaurant fire, 91:2.32
- Torch ignites roof, 97:6.19
- Torch ignites roof framing, 98:2.19
- Torch ignites school fire, 93:4.28
- Torch ignites shingles, wood trim, 97:2.21
- Vapor cloud ignites, causes explosion, 93:5.67, 93:6.30
- Water heater pilot light ignites spilled gasoline vapors, 93:2.21
- PROTECTIVE CLOTHING**
 - Rescue worker without clothing killed, 96:5.94
- PROULX, GUYLENE**
 - Profile of, 97:3.47
- PUBLIC ASSEMBLY OCCUPANCIES**
 - Crown Coliseum arena, Cincinnati, Ohio, updates fire protection system, 98:3.120
- PUBLIC ASSEMBLY OCCUPANCIES, FIRES IN.** *See also* specific occupancies
 - Entertainment center, Pennsylvania, Jan. 28, 1997, 98:6.92
 - Meeting hall fire, Massachusetts, 1997, 98:1.21
 - Meeting hall fire, Missouri, 1997, 98:2.19
- PULLAN, ART**
 - Profile of, 98:3.57
- PYROTECHNICS.** *See also* **EXPLOSIVES; FIREWORKS**
 - Catastrophic storage and manufacturing facility explosion and fire, Tennessee, June 5, 1997, 98:5.53
- Q**
- QUEBEC, CANADA**
 - Fatal board and care facility fire, Aug. 31, 1996
 - Analysis of fire, 97:1.44
 - Fire investigation report, 98:5.38
 - Tire fire, 1990, 91:1.55
- R**
- RACE TRACK FIRES**
 - Louisiana, Dec., 1993, 94:6.89
- RACK STORAGE**
 - Fire in, 91:6.26
- RADIO COMMUNICATIONS.** *See also* **FIRE SERVICE COMMUNICATIONS**
 - Ham radio operators' role in emergency communication, 96:2.46
- RADIO STATION FIRES**
 - California, 1994, 95:4.40
- RAILROAD ROLLING STOCK FIRES**

NFPA Journal
10 Year Index 1987-1997

Catastrophic

- Freight train and tractor trailer-tanker collision, Tennessee, June 19, 1990, 91:4.70
- Freight train collision, Georgia, Aug. 19, 1990, 91:4.72
- Freight train collision, Illinois, Dec. 22, 1995, 96:5.101
- Passenger train collision, Florida, March 17, 1993, 94:5.106
- Passenger train collision, Maryland, Feb. 16, 1996, 97:5.54, 6.59
- Freight train collision, Kansas, July 2, 1997, 98:6.91
- Hazardous materials database software for responders, 97:3.66
- Locomotive collision, Texas, Oct. 25, 1997, 98:6.91
- Rail fires survey, NFPA Rail Transportation Systems Section, 91:1.101
- Technological advances, training, key to safety efforts, 97:3.64
- Weyauwega, Wisc., LP-Gas tank car derailment, March 4, 1996, 96:3.89, 97:6.60

RECORDS STORAGE FIRES

- Iron Mountain, Inc. fire, South Brunswick, New Jersey, March, 1997, spotlights problems of large records-retention facilities, 98:2.68
- Pennsylvania, May 5, 1997, 98:6.91

RECREATIONAL FACILITY FIRES. *See also* AMUSEMENT CENTER FIRES; AMUSEMENT PARK FIRES

- Athletic complex, Arizona, 1993, 94:5.30
- Bowling alley, Maine, 1992, 93:1.26
- Bowling alley, vacant, Michigan, 1991, 92:2.29
- Building-under-construction, Illinois, March, 1992, 93:6.88
- Gymnasium, Rhode Island, Jan., 1992, 93:6.79
- National Park Visitors Center, Utah, 1991, 92:1.23

RECREATIONAL VEHICLE FIRES

- Camper van, catastrophic, Ohio, Nov. 11, 1991, 92:4.70
- Carburetor floods, releases gasoline vapors which ignite, 98:6.89
- Jet ski, vacuum cleaner ignites gasoline vapors, 92:5.28

REFINERIES, OIL, FIRES

- California, Oct., 1992, 93:6.82
- California, Jan., 1995, 96:6.63
- California, Jan. 21, 1997, 98:6.84
- Catastrophic**
 - Louisiana, Aug. 2, 1993, 94:5.105, 94:6.93
 - Pennsylvania, Oct. 16, 1995, 96:5.96
- Louisiana, March 3, 1991, 92:4.70, 92:6.77
- Ohio, Oct. 12, 1996, 97:6.49
- Texas, April, 1991, 92:6.75
- Utah, 1993, 94:6.36

RELIEF AGENCIES

- Efforts after Northridge, Calif. earthquake, 95:3.52

RENFREW, HENRY W.

- Profile of, 94:4.22

RESCUE. *See* FIRE SERVICE RESCUE AND EXTRICATION

RESEARCH LABORATORY FIRES

- Pennsylvania, 1991, 92:4.25

RESIDENTIAL FIRES. *See also* APARTMENT BUILDING FIRES; APARTMENT COMPLEX FIRES; CONDOMINIUM FIRES; DWELLING FIRES; MANUFACTURED HOME FIRES; MULTIPLE-OCCUPANCY FIRES

- Candles as cause of, statistics and fire safety information, 98:3.160
- Fire fighter fatalities related to, 95:4.87
- Fire statistics and safety information, 98:5.112
- Home health care safety risks, 98:1.64
- Kitchen fire statistics, fire safety information, 98:1.88

NFPA Journal
10 Year Index 1987-1997

NFPA "Great Escape" promotes home fire drills and escape plans, 98:3.74, 4.32
Products ignited in, 91:5.72
Reporting protocol for non-dwelling fires revised, 96:4.55
Residential sprinkler ordinances hurt by public's misconceptions, 98:2.58
Residential sprinklers discussed on television talk show, 98:3.52

RESORT FIRES

Colorado, 1992, 93:1.25

RESTAURANT FIRES

California, 1990, 92:3.34

California, 1992, 93:4.28, 93:5.35

California, 1997, 98:3.36, 4.22

Catastrophic

Indiana, Feb. 6, 1992, 93:5.66

Iowa, Oct. 17, 1994, 95:5.62

Connecticut, 1996, 97:4.22

Florida, 1994, 95:2.31

Florida, 1996, 97:3.29

Illinois, 1991, 92:5.30

Illinois, Oct. 18, 1996, 97:6.59

Indiana, 1995, 96:5.25

Massachusetts, 1955, 1965; Wayside Inn fires, 94:6.75

Massachusetts, 1996, 97:4.22, 5.22

Michigan, 1990, 91:2.32, 91:6.23

Michigan, 1994, 95:1.34

Michigan, 1995, 96:3.35

Minnesota, 1991, 92:6.25

New York, 1996, 97:6.22

North Dakota, 1993, 94:3.28

Ohio, 1995, 96:3.35

Ohio, 1997, 98:6.21

Oklahoma, Jan., 1994, 95:6.98

Safe commercial cooking operations, 97:1.33

Tennessee, 1997, 98:5.18

Virginia, 1995, 96:3.36

Virginia, 1996, 97:2.21

Wisconsin, 1993, 94:3.29

RHODE ISLAND

Apartment building fire, 1992, 93:2.22

Catastrophic fires

Aircraft, Aug. 26, 1995, 96:5.99

Apartment building, Feb. 27, 1993, 94:5.96

Apartment building, Dec. 23, 1995, 96:5.93

College building fire, 1994, 95:3.37

Dwelling fire, 1995, 96:6.22

Gymnasium fire, Jan., 1992, 93:6.79

School fire, March, 1992, 93:6.79

Store fire, 1994, 95:3.39

Warehouse fire, May, 1992, 93:6.86

Warehouse fire, 1994, 95:3.39

RICHARDSON, J. KENNETH

Profile of, 91:5.20

ROBOTS

Tokyo fire service pioneers use, 92:2.67

ROCKET FUELS

NFPA Journal
10 Year Index 1987-1997

Mixture ignites, causes test facility explosion, fire, 95:4.40

ROOFS. *See also* CONCEALED SPACES; WOOD SHINGLES, SHAKES

Asphalt layers factor in fire spread, 95:6.107

Collapse

Apartment building fire, in, 97:3.30

Building supply store fire, in, 97:6.54

Building-under-construction fire, in, 91:3.27

Catastrophic dwelling fire, in, 97:5.50

Defensive attack required, 98:1.21, 6.89

Equipment damaged by, 94:6.94

Fire fighter fatalities related to, 98:4.59

Fire fighter injuries related to, 96:6.109, 98:6.54

Fire fighting hampered by, 93:6.29, 93:6.83, 94:6.95, 96, 97, 95:6.37, 100, 106, 107, 108, 96:6.70

Fire spread by, 94:6.95

Hotel fire, in, 97:6.19

Manufacturing plant fire, in, 92:6.80, 97:6.49, 52

Rescue prevented by, 93:5.64

Shopping mall fire, in, 97:4.21, 6.21

Snow, damages electrical panel, ignites manufacturing plant fire, 97:1.28

Sprinkler system damaged by, 96:6.62

Sprinkler system rendered inoperable by, 91:6.74, 75, 93:6.84, 85, 98:6.87

Storage facility fire, 98:5.18

Store fire, in, 92:6.78

Trusses, collapse of, cause of fire fighter fatalities, 97:4.57

Trusses, collapse of, in apartment building fire, 97:2.22

Trusses, collapse of, in automobile repair shop fire, 97:2.23

Water supply cut off by, 93:6.83

Concrete thickness delays venting, 95:6.106

Electrical grounding, ignited by, 95:5.35

Fire spread across/through, 92:4.70, 92:5.30, 94:4.31, 94:5.98, 94:6.93, 96:2.23, 96:3.35, 97:1.27, 5.21, 49, 6.21, 53, 57, 98:2.18, 3.38

Fire spread to, 70, 91:4.57, 91:5.28, 91:6.73, 92:4.69

Fire started in, 94:4.29, 97:6.59

Fire vented through, 91:4.67, 98:2.20

Fireworks, ignited by, 92:4.27

Gas-fueled fire, ignited by, 94:6.35

Gasoline-powered saw, ignited by, 92:3.31

Grass fire, ignited by, 91:4.26

Insulation ignited by welding, 94:6.94

Layer ignited, 94:6.95

Lightning, ignited by; framing fails and collapses, 92:6.78

Lightning travels along metal roof, ignites rafters, 95:6.98

Metal roof installed over existing roof created concealed spaces, 95:4.40

Multiple layers, hamper fire service operations, 97:6.21

Noncombustible, limited fire spread, 94:6.97

Plywood subroof spreads fire, 94:6.94

Roofers run screw through electrical conduit, ignite fire, 95:6.99

Roofer's torch, tar ignites roof framing, 98:2.19

Roofer's torch ignites insulation, 95:3.40

Roofer's torch ignites roof, 94:3.29, 95:6.98, 97:2.21, 6.19

Roofer's torch possibly ignites roof, 96:6.73

Sawtooth roof design channeled fire to assembly area, 95:6.104

Second roof installed over existing roof conceals fire, 98:6.84

NFPA Journal
10 Year Index 1987-1997

Sloped, delayed sprinkler activation, 98:6.89
Tar, ignited by, 91:6.23
Tar kettle ignites propane leak, 97:3.33
Tar on roof contributes to fire spread, 94:6.93, 94, 95
Tar paper ignited by torch, 94:6.96
"Tudor" soffit allowed fire spread, 94:6.90
Wood, factor in wildland fire spread, 94:6.99
Wood shake shingles factor in wildland fire spread, 93:6.89
Wood shingles ignited by cigarette, 96:5.25
Wood shingles ignited by fireworks, 96:4.21, 97:3.30
Wood-and-tar roof ignited by torch, 94:6.95

ROOMING HOUSE FIRES

Catastrophic, Ohio, Feb. 18, 1991, 92:4.67
Massachusetts, 1996, 97:1.26, 6.19

RUBBER FIRES. See also FOAM RUBBER OR POLYURETHANE

Hot rubber waste ignited in waste hopper, 95:4.40

RUBBISH AND TRASH. See also DUMPSTER FIRES

Aerosol can used to ignite trash, 97:1.27
Apartment fire spread, factor in, 91:4.25
Basement debris, fire ignited in, 94:5.98
Burning paper in waste disposal system ignites stored waste, 97:5.24
Cigarette lighter used to ignite dumpster trash, 98:4.20
Cigarette(s) ignite construction debris, 97:3.30
Cigarette(s) ignite fire in trash barrel, 94:6.35
Cigarette(s) ignited trash in catastrophic fire, 92:4.69
Cigarette(s) ignites fire in trash bag, 96:5.24
Debris used as shelter by homeless burned in catastrophic fire, 98:5.53
Dumpster, fire ignited in; involves warehouse, 91:1.31
Electric skillet ignites trash container, 95:2.29
Lighter ignites trash in catastrophic fire, 91:4.68
Manufacturing plant fire, ignited in, 98:6.87
Rags soiled with stain ignite other trash, 95:6.38
Shredded trash, fire ignited in, 93:6.82
Smoking materials ignite fire in trash container, 96:3.35
Smoking materials ignite trash in catastrophic fire, 97:5.52
Trash, fire ignited in, 96:2.25
Trash container, fire ignited in, 94:5.27
Trash on loading dock, fire ignited in, 93:6.84
Unknown source ignites trash in catastrophic fire, 92:4.69
Waste chemicals in dumpster react, ignite waste products, 97:5.24

RUGS. See CARPETS AND RUGS

RURAL FIRES

Prevention is shared responsibility of citizens, fire service, government, 94:5.35

S

SAN FRANCISCO, CALIF.

Earthquake and subsequent fires, October 17, 1989, 94:3.88
Fire department peer mediation program, 91:3.62
Fire fighting challenges of city fire department, 94:3.119

SANDERS, RUSSELL E.

Profile of, 93:1.20

SAWMILL FIRES

California, March, 1991, 92:6.79
Wyoming, 1991, 92:1.26

SCANNELL, JERRY

NFPA Journal
10 Year Index 1987-1997

Profile of, 96:3.55

SCHOOLS

Exits require balancing fire safety and security needs, 98:3.46

Fire drills, planned programs for, 91:2.24

Natural gas explosion, New London, Texas, March 18, 1937, 93:5.94

School fire safety holds lessons for other occupancies, 97:5.104

SCHOOL FIRES

California, 1991, 92:6.29

Catastrophic, elementary, Maryland, Oct. 24, 1993, 94:5.105

Under construction, Minnesota, 1994, 95:3.39

Elementary, California, 1992, 93:4.28

Elementary, California, 1997, 98:1.21

Elementary, Massachusetts, 1992, 93:3.33

Elementary, Oregon, 1991, 92:2.25

Elementary, Utah, March, 1995, 96:6.73

Middle, Oregon, 1993, 94:5.28

Our Lady of the Angels school, Chicago, IL, 1958, 96:1.72

Secondary, Florida, 1993, 94:1.29

Secondary, Indiana, April, 1994, 95:6.98

Secondary, Indiana, Dec., 1994, 95:6.98

Secondary, Massachusetts, 1991, 92:4.27

Secondary, Pennsylvania, 1996, 97:3.34

Secondary, Rhode Island, March, 1992, 93:6.79

Secondary, Tennessee, 1993, 94:2.30

Secondary, Virginia, 1995, 96:5.25

Vacant, Nova Scotia, Canada, 1991, 92:5.30

Vacant school complex, Mississippi, 1990, 91:3.27

SCOTTSDALE, ARIZONA

Required residential sprinklers increase fire safety, 97:4.40

SEATTLE, WASHINGTON

Fire alarm system installer certification required by, 93:1.55

Ship fire, Sept. 16, 1991, 92:6.48

SECURITY PROVISIONS

Airport security measures jeopardize life safety, 96:6.85

Building security measures contribute to fire deaths, 94:3.110

Chain and lock on fenced area, factor in storage facility fire, 97:6.56

Electronic locking devices hindered rescue in catastrophic prison fire, 92:4.70

Fire safety implications of home security systems, 94:3.4

Gates, chains, factor in school fire, 93:6.79

Gates, factor in fatal fire, 95:3.37

Locked exits (*See* EXITS)

School exits require balancing fire safety and security needs, 98:3.46

Security bars

Catastrophic fires, factor in, 91:4.64, 93:5.62, 94:5.95, 96, 96:5.93, 97:5.51,
98:5.45, 50

Fatal fires, factor in, 91:4.26, 92:6.28, 94:3.110, 95:2.29, 96:1.23

Washington, D.C airports equipped with state-of-art security systems, 98:4.80

SELF-CONTAINED BREATHING APPARATUS

Air supply used up, cause of fire fighter fatalities, 96:5.96

SEMICONDUCTOR MANUFACTURING

Fire protection for, 92:2.32

SERVICE STATIONS

Station design must consider technology, market demand, code and federal requirements,
98:4.76

NFPA Journal
10 Year Index 1987-1997

SERVICE STATION FIRES

Massachusetts, 1995, 96:6.21

SEWAGE TREATMENT PLANTS. *See* WASTEWATER TREATMENT PLANTS

SHANTY FIRES

Catastrophic, Pennsylvania, March 24, 1990, 91:4.69

SHARRY, JOHN

Profile of, 94:6.26

SHED FIRES

California, 1991, 92:6.26

Catastrophic, Missouri, Sept. 14, 1991, 92:4.70

Texas, 1992, 93:2.20

SHIP EXPLOSIONS

Munitions ship, Halifax, Nova Scotia, Dec. 6, 1917, 92:3.96

SHIP FIRES. *See also* BARGE FIRES; BOAT FIRES

Catastrophic

Barges, Louisiana, Oct. 30, 1990, 91:4.70

Passenger cruise ship, Alaska, July 27, 1996, 97:5.54

Tanker, Texas, Oct. 9, 1993, 94:5.108

Cruise vessel fires raise questions about regulations, 98:3.66

Fish-processing vessel, Seattle, Wash., Sept. 16, 1991, 92:6.48

Florida, Aug., 1993, 94:6.98

Large-loss-of-life

General Slocum excursion steamer, N. Y., N. Y., 1904, 95:4.80

S. S. Noronic, Toronto, Canada, Sept. 17, 1949, 97:1.58

NFPA's 75 years of marine fire protection, 97:2.90

Tanker fire safety, 98:3.70

Texas, Nov. 11, 1997, 98:6.91

SHOPPING MALL FIRES

Arkansas, 1996, 97:4.21

California, 1993, 94:6.35

Florida, Sept. 6, 1996, 97:6.53

Missouri, 1997, 98:2.20

Nevada, 1992, 93:2.19

New Jersey, 1990, 92:1.21

New Jersey, 1997, 98:6.21

New York, May, 1991, 92:6.77

Pennsylvania, Dec., 1994, 95:6.99

Pennsylvania, 1996, 97:6.21

West Virginia, March, 1995, 96:6.70

Wisconsin, 1989, 91:1.29

SIGNALING SYSTEMS. *See* ALARM SYSTEMS

SIMMONS, PHILIP

Profile of, 94:2.23

SINCE YOU ASKED COLUMNS

Electrical experts answer questions on /iNational Electrical Code/I, 96:1.28

Fire extinguisher questions, 96:4.28

Hazardous materials classification and containment, 96:2.30

NFPA 99, *Health Care Facilities*, questions, 96:6.28

Public fire protection's most asked questions, 96:5.30

Questions on various codes answered, 96:3.44

SMITTLE, WALTER, III

Profile of, 92:6.20

SMOKE DETECTORS. *See* DETECTORS, SMOKE

SMOKE INHALATION

NFPA Journal
10 Year Index 1987-1997

Fire fighter injuries related to, 91:6.52, 94:6.64, 97:6.75

Smoke and burns compared as fire death causes, 95:1.38

SMOKE REMOVAL SYSTEM

Polyurethane foam manufacturing plant fire, use on, 98:6.21

SMOKE VENTS

Satisfactory performance, warehouse fire, 96:4.23

SMOKING MATERIALS. *See also* CIGARETTES

Careless disposal of

Apartment building fire cause, marijuana cigarette, 97:5.22

Barracks fire cause, 91:6.77

Board and care facility fire cause, 93:1.29, 98:5.53

Catastrophic apartment building fire cause, 94:5.102

Catastrophic board and care facility fire cause, 93:5.66, 95:5.64, 97:5.52

Catastrophic dwelling fire cause, 95:5.56

Catastrophic fire cause, 93:5.66, 94:5.102, 95:5.56, 64

Catastrophic fraternity house fire cause, 97:5.50

Dwelling fire cause, 95:1.34

Fatal dwelling fire cause, possible, 91:5.26

Fraternity house fire cause, 97:6.21

Funeral home fire cause, 96:6.24

Hospital fire cause, possible, 92:2.27

Hotel fire cause, 96:5.24

Motor vehicle repair shop, 91:2.30

Passenger terminal fire cause, 92:6.76

Restaurant fire cause, 93:5.35, 96:3.35

Warehouse fire cause, 95:2.30

Wildland/urban interface fire cause, possible, 95:6.111

Careless use of

Catastrophic apartment building fire cause, 96:5.91, 98:5.46

Catastrophic board and care facility fire cause, 91:4.68, 96:5.96, 96:5.97, 97:5.53

Catastrophic dwelling fire cause, 91:4.67, 93:5.62, 96:5.91, 96:5.92, 97:5.50,
98:5.46

Catastrophic limited care facility fire cause, 91:4.69, 93:5.62

Dwelling fire cause, 95:2.30

Fatal dwelling fire cause, 98:5.15

Fatal hotel fire cause, 98:6.23

Fatal oil-change facility fire cause, 96:3.40

Manufacturing plant fire cause, 97:6.50

Incendiary fire started by, catastrophic fire cause, 95:5.64

NFPA joins fight against smoking, 94:4.4

U. S. fire deaths caused by, 1995 statistics, 98:1.56

U. S. fire deaths caused by, overview of, 1980-88, 91:1.86

SOFTWARE. *See* COMPUTER SOFTWARE

SOLVENTS

Aerosol solvent containers damaged by forklift, explode, 96:4.23

Drums of solvent ignited, 95:6.103

Gasoline, used as solvent, ignited by gas furnace, 92:6.28

Hot engine, ignited by, 95:3.39

Printing plant fire fueled by, 96:6.63

PVC, ignited by torch, 96:6.23

Spark from forklift, ignited by, 92:4.28

SOUTH CANYON FIRE, COLO.

Wildland fire, 1994, 95:2.51

SOUTH CAROLINA

NFPA Journal
10 Year Index 1987-1997

Automobile repair shop fire, 1996, 97:5.23
Catastrophic fires
Board and care facility, Nov. 22, 1990, 91:4.69
Dwelling, Nov. 7, 1992, 93:5.64
Dwelling, May 23, 1993, 94:5.96
Dwelling, Nov. 13, 1993, 94:5.102
Manufactured home, Sept. 6, 1996, 97:5.51
Manufactured home, Jan. 19, 1997, 98:5.45
Manufacturing plant, June 17, 1991, 92:4.70
Electric generating plant fire, Dec., 1994, 95:6.100
Fatal truck/storage tank fire, 1990, 91:2.32
Manufacturing plant fire, 1991, 92:3.32
Manufacturing plant fire, June, 1991, 92:6.80
Manufacturing plant fire, Nov. 4, 1997, 98:6.87
Manufacturing plant fire, Jan., 1992, 93:6.83
Manufacturing plant fire, Jan., 1993, 94:6.95
Store fire, Jan. 7, 1997, 98:6.89
Warehouse fire, Feb. 10, 1997, 98:6.88

SOUTH DAKOTA

Catastrophic dwelling fire, May 8, 1990, 91:4.66
Fatal fireworks display accident, 1995, 96:4.24
Manufacturing plant fire, 91:6.75

SOVIET UNION

Fire prevention and suppression programs in, 91:6.67

SPARKS

Electrical conduit ignited natural gas, 91:6.74
Gasoline ignited by, 91:2.31
From grinding operation ignited building materials, 91:6.75
From steel wool ignited varnish remover, 91:6.24
From tool ignited gasoline, 91:4.30
Wood fibers ignited by, 97:6.50

SPAS

National Electrical Code prevents accidents, 92:4.22

SPONTANEOUS IGNITION

Boxed adhesive materials, 91:6.26
Chemicals (CMDP) in laboratory, 91:5.30
Hydrogen peroxide, 93:2.21
Oil-soaked rags, 28, 91:5.64, 91:6.25, 92:4.71, 92:5.56, 92:6.74, 93:4.26, 93:6.79,
94:3.27, 94:4.31, 98:6.21
Polyurethane foam bungs, 98:6.21
Solvent soaked rags, 94:3.27
Stain-soaked paper towels, 98:4.21
Stain-soaked rags, 95:6.38
Varnish-saturated paper towels, 91:1.29

SPORTS UTILITY VEHICLE FIRES. See TRUCK FIRES

SPRINKLER SYSTEMS. See also DELUGE SYSTEMS

Advances in systems and codes over thirty years, 96:5.75
Backflow prevention assemblies protect public water supply, 97:4.68
Backflow prevention discussed by fire protection, water supply industries, 97:6.26
Board and care facilities use, 98:5.34
Community marketing strategy for residential sprinklers, 96:4.27
Design-related problems, 93:6.12
Energized electrical/electronic equipment, use above, 93:6.31
Fire department pumpers supply system, high-rise building fire, 91:5.65

NFPA Journal
10 Year Index 1987-1997

- Fire safety importance of sprinkler systems, 93:1.53
- Health care facility fires, systems prevent tragedy in, 93:5.49
- Heat/flames cause sprinkler pipe elbow to fail, limits fire, 98:5.15
- New technology of sprinkler systems, 94:3.38
- NFPA 13, *Installation of Sprinkler Systems*, changes in 1996 edition, 97:1.34
- NFPA 13, *Installation of Sprinkler Systems*, 1991 edition overview, 91:5.12
- NFPA 13, *Installation of Sprinkler Systems*, 1994 edition, changes in, 94:3.14
- NFPA sprinkler system requirements to be consolidated in NFPA 13, 98:1.26
- Nursing home fire verifies authority having jurisdiction/engineers joint design, 95:2.85
- Questions on installation answered, 97:5.27
- Residential sprinkler ordinances hurt by public's misconceptions, 98:2.58
- Residential sprinklers discussed on television talk show, 98:3.52
- Sample training exercise for sprinkler placement, 96:4.49
- Scottsdale, Arizona, experience with required residential sprinklers, 97:4.40
- Specialized sprinklers provide more protection at less cost, but create new challenges, 98:1.72
- Training for fire fighters on system operation; review of literature, 94:3.59
- U. S. experience with sprinklers, 93:6.44
- Warehouse sprinkler system design, 93:4.16
- SPRINKLER SYSTEMS NOT A FACTOR IN FIRE**
- Branch line disconnected, 91:4.67
- Closed valve, 93:5.67, 93:6.82, 97:6.58
- Did not cover area of fire, 92:4.70, 92:5.30
- Disconnected, 91:3.31, 91:4.68, 95:6.108, 96:5.23, 97:6.56, 57
- Disconnected for ongoing construction, 93:6.86, 95:6.35, 108
- Fire above reach of system, 93:6.83, 95:6.107, 96:6.65, 97:6.59
- Fire burns through PVC sprinkler supply pipe, 96:5.24
- Fire extinguished prior to activation, 96:5.26, 97:6.22
- Fire extinguished quickly, 98:5.17
- Fire on exterior of building, 94:6.35, 97:5.22
- Heat not sufficient to activate, 93:5.37, 95:5.33
- Inoperable at time of fire, 91:6.73, 92:2.29, 93:2.44, 93:6.85, 86, 88
- Inoperable while undergoing repair, 98:6.88
- Installation incomplete, 92:4.71, 92:5.28, 56
- Local systems only, 94:6.94
- Manual system not activated, 93:6.27, 82
- Not located in area of origin, 94:6.93, 96:5.97, 97:5.49, 52, 6.52, 54, 57, 98:5.54, 6.22, 89, 91
- Not operational, 94:6.92, 97, 98, 95:6.108
- Not operational due to closed valve, 96:5.94
- Not operational due to earlier roof collapse, 97:6.50, 56
- Not operational due to poor maintenance, 95:6.104
- Not operational due to previous fire, 97:6.54
- Partial system only, 95:1.31
- Rendered inoperable by collapse of support, 91:6.74
- Rendered inoperable by explosion, 91:6.74, 98:6.87
- Rendered inoperable by explosion, building collapse, 96:5.94, 96:6.69
- Rendered inoperable by roof collapse, 93:6.84, 85, 96:6.62, 98:6.87
- Rendered inoperable by tank BLEVE, 96:6.63
- Shut off for winter, 97:6.57
- Shut off prior to fire, 91:6.26, 97:5.52
- Water pipes frozen, 95:1.32
- Water supply ruptured by metal fragments, 96:6.72
- Water supply shut off, 94:6.91, 95, 96:2.25, 96:5.26, 98:6.89

NFPA Journal
10 Year Index 1987-1997

SPRINKLER SYSTEMS, SATISFACTORY PERFORMANCE, 91:1.28, 29, 30, 2.29, 30, 31, 3.25, 29, 31, 4.25, 5.25, 26, 28, 30, 6.24, 92:1.21, 22, 23, 26, 2.27, 3.34, 4.26, 27, 28, 5.28, 30, 6.25, 26, 29, 93:1.26, 27, 28, 4.25, 5.35, 37, 38, 49, 67, 6.29, 81, 86, 94:1.29, 30, 32, 2.27, 29, 30, 3.27, 28, 29, 4.29, 30, 31, 5.29, 30, 105, 6.33, 34, 35, 93, 95, 95:1.34, 2.29, 30, 32, 85, 3.39, 40, 4.40, 5.33, 6.37, 38, 98, 104, 96:1.22, 24, 2.23, 24, 25, 26, 3.36, 39, 40, 4.23, 24, 5.23, 24, 25, 6.21, 22, 23, 24, 64, 97:1.25, 26, 27, 3.33, 34, 4.22, 5.22, 24, 6.22, 49, 54, 98:1.24, 2.18, 20, 3.41, 42, 4.20, 5.15, 17, 18, 5.53, 6.21, 22, 84, 85, 87, 88, 89

SPRINKLER SYSTEMS, UNSATISFACTORY PERFORMANCE

Corroded valve prevents operation, 92:3.32
Did not function properly, reason unknown, 93:6.84
Did not operate, 94:6.90
Did not operate promptly, 98:6.88
Dry-pipe system failed to operate, 94:6.96
Failed to control fire, 94:6.96, 98:6.88, 91
Fire shielded from sprinkler system, which did not operate, 98:1.24
Fire spread to concealed spaces, 97:6.22
HVAC equipment blocked sprinklers, 94:2.30
Inadequate for hazard, 95:6.107, 96:6.62
Inadequate for storage configuration, 91:2.33, 93:1.26, 93:6.87, 96:6.62, 96:6.70, 97:6.54, 56, 98:6.89
Interior partitions obstructed spray pattern, 93:5.35
No fire department connection, 96:6.62
No in-rack sprinklers, 98:6.88, 89
Overpowered by dust explosions, 97:6.49
Overpowered by fire, 91:6.75, 76, 92:6.78, 79, 93:6.84, 94:6.91, 93, 94, 97, 96:6.62, 97:6.54, 98:6.21, 86
Overpowered by fire, inadequate design, 91:6.37, 92:6.75, 93:4.33, 93:6.85
Plywood shelving interfered with system operation, 97:6.54
Shut down prematurely, 95:6.103
Sloped roof delayed sprinkler activation, 98:6.89
Solid shelving interfered with system operation, 98:6.84, 85, 89
Storage arrangement caused unnecessary sprinklers to activate, 98:1.25
System damaged by explosion, 94:6.90, 92
Ventilation hood blocks water from fire, 92:5.25, 96:6.62
Water supply inadequate, 91:4.68
Water supply inadequate, due to faulty booster pump, 98:6.91

ST. JOHN, NEW BRUNSWICK

Detention facility fire, June 21, 1977, 94:5.50

ST. LOUIS, MISSOURI

Fire service facilities renovation, 91:1.94

STADIUM FIRES

Atlanta and Texas fires demonstrate unique protection problems, 94:4.49

STAIRWAYS

Catastrophic fire spread up, 91:4.64, 65, 66, 92:4.67, 69, 93:5.62, 64, 66, 67, 94:5.95, 96, 97, 98, 100, 102, 104, 95:5.53, 54, 58, 59, 60, 96:5.92, 97:5.49, 50, 54
Exterior wooden, fire spread up, 98:5.49
Fire spread up, 93:1.29, 93:5.36, 93:6.28, 86, 95:6.106, 97:6.20, 98:5.45, 5.50
Heat and smoke spread up, 98:5.17, 5.53
Limited egress from second floor in large loss of life club fire, 91:4.67

STANDARDS. *See* CODES AND STANDARDS

STANDPIPE SYSTEMS

Handline used to extinguish equipment fire, 96:4.24
Lack of connections hampers fire fighting, 94:6.92

NFPA Journal
10 Year Index 1987-1997

Pressure-regulating devices in, 91:5.70
Water supply damaged by explosion, 94:4.104

STORAGE FACILITIES

Underground Hunt Midwest SubTropolis facility, Kansas City, Missouri, requires unique fire protection measures, 98:6.68

STORAGE FACILITIES FIRES. See also TANK STORAGE FACILITIES FIRES; WAREHOUSE FIRES

Agricultural products, Washington, March, 1995, 96:6.68
Agricultural products (grain elevator), Alberta, Canada, 1996, 97:4.20
Agricultural products (grain elevator), Indiana, Oct. 1, 1996, 97:5.52
Alcohol, Kentucky, Nov. 7, 1996, 97:6.57
Barn, Massachusetts, 1995, 96:2.25
Catastrophic
Ammonium nitrate storage silos, Minnesota, Nov. 17, 1993, 94:5.105
Chemical storage, Arkansas, May 8, 1997, 98:5.53
Chemical storage, Ohio, May 27, 1994, 95:5.66
LP-Gas underground bulk storage, Texas, April 7, 1992, 93:5.67
Chemical storage, Texas, June/July, 1995, 96:6.66
Commercial warehouse, Maryland, 1992, 93:1.26
Food products, California, April, 1994, 95:6.107
Food products, Missouri, Oct., 1994, 95:6.104
Food products, Nebraska, March, 1995, 96:6.69
Furniture storage, Georgia, March, 1994, 95:6.106
Garage, Colorado, 1996, 97:1.26
Grain mill and storage facility, Washington, 1991, 92:4.28
Heavy equipment, New York, July, 1995, 96:6.68
LP-Gas bulk storage, Texas, 1994, 95:1.31
LP-Gas underground bulk storage, Texas, April, 1992, 93:6.87
Lumber, New Hampshire, Jan. 8, 1996, 97:6.56
Lumber storage shed, California, 1991, 92:6.26
Mini-storage facility, Ohio, 1993, 94:2.27
Miscellaneous, New York, March, 1995, 96:6.69
Motor home, California, 1994, 95:5.36
Natural gas and gasoline storage, California, 1992, 93:6.29
Plastic storage and recycling, Georgia, March, 1993, 94:6.97
Polyurethane storage, New Jersey, 1990, 91:5.30
Propane storage tank, North Dakota, 1993, 94:1.30
Public works building, Michigan, 1996, 97:5.24
Pyrotechnics, Tennessee, June 5, 1997, 98:5.53
Records storage, New Jersey, March, 1997, 98:2.68
Records storage, Pennsylvania, May 5, 1997, 98:6.91
Residential storage shed, Missouri, 1997, 98:3.36
Rolled paper storage, Georgia, Sept., 1995, 96:6.68
Roofing supplies storage, Massachusetts, 1996, 97:2.23
Self-storage facility, Massachusetts, 1991, 92:5.28
Self-storage facility, Missouri, 1997, 98:5.18
Shoe distribution and storage facility, 1993, 94:2.27
Tires, Pennsylvania, March 13, 1996, 97:6.59
Vehicle storage and workshop building, Texas, 1994, 95:6.38
Zoo, Pennsylvania, 1995, 96:6.24

STORE FIRES. See also SHOPPING MALL FIRES

Appliances, California, 1992, 93:2.19
Automobile repair (*See* AUTOMOBILE REPAIR SHOP FIRES)
Automobiles

NFPA Journal
10 Year Index 1987-1997

- Illinois, 1993, 94:1.32
- New York, April, 1993, 94:6.91
- Pennsylvania, 1992, 93:3.36
- Pennsylvania, Dec. 21, 1997, 98:6.89
- Block of stores
 - Illinois, 1992, 93:3.34
 - Illinois, Apr. 24, 1996, 97:6.54
- Building materials
 - Alaska, April, 1994, 95:6.100
 - Florida, 1993, 94:4.30
 - Georgia, Apr. 16, 1996, 97:6.54, 98:1.50
 - Massachusetts, May, 1995, 96:6.70
 - Massachusetts, May 23, 1995, 98:1.50
- Clothing
 - California, 1995, 96:5.26
 - Maryland, 1991, 92:3.31
 - New Jersey, 1990, 92:1.21
 - New Jersey, Jan., 1991, 92:6.78
 - New York, Dec. 8, 1995, 96:5.94
- Department
 - California, 1992, 93:5.38
 - California, 1996, 97:1.27
 - Georgia, Oct. 26, 1997, 98:6.89
 - Hawaii, July, 1993, 94:6.91
 - Minnesota, 1991, 92:6.25
 - Mississippi, 1993, 94:1.32
 - North Carolina, 1997, 98:6.22
 - Oregon, 1996, 97:3.33
 - Pennsylvania, Dec., 1994, 95:6.99
 - Tennessee, Oct., 1993, 94:6.91
 - Texas, Sept., 1995, 96:6.72
- Drug, Pennsylvania, 1993, 94:6.35
- Electronics
 - Florida, Oct. 25, 1997, 98:6.89
 - Florida, Oct. 26, 1996, 97:6.54
- Fireworks, Ohio, July 3, 1996, 97:5.52
- Fishing supplies, Washington, 1991, 92:3.32
- Flea market, Florida, Jan., 1993, 94:6.91
- Furniture repair, Massachusetts, 1996, 97:5.24
- Gifts, Tennessee, July, 1992, 93:6.81
- Grocery
 - Florida, 1993, 94:5.30
 - New York, Aug. 22, 1994, 95:5.66
- Hardware
 - California, 1997, 98:4.21
 - Florida, 1993, 94:4.30
 - Hawaii, 1993, 94:3.30
 - Michigan, Jan. 25, 1996, 97:6.53
- Laundromat, Massachusetts, 1992, 93:3.36
- Laundry/linen supplies, Tennessee, May 23, 1996, 97:6.54
- Liquor, Wisconsin, 1993, 94:3.29
- Lumber
 - Alaska, April, 1994, 95:6.100
 - Ohio, 1989, 91:1.28

NFPA Journal
10 Year Index 1987-1997

- Manufactured home parts, Illinois, Oct. 29, 1996, 97:6.53
- Mixed use, Massachusetts, 1994, 95:4.39
- Mixed use, Vermont, 1989, 91:1.27
- Mixed use, Virginia, April, 1995, 96:6.63
- Natural gas refueling station, Michigan, 1993, 94:4.30
- New Jersey, April 17, 1997, 98:6.89
- Open air flea market, South Carolina, Jan. 7, 1997, 98:6.89
- Renovations can lead to code-compliance problems, 97:4.26
- Rental, Rhode Island, 1994, 95:3.39
- Secondhand goods, Michigan, Dec., 1995, 96:6.69
- Sporting goods, Connecticut, 1993, 94:6.35
- Supermarket
 - California, 1990, 91:2.30
 - Massachusetts, 1989, 91:1.28
 - Massachusetts, 1994, 95:5.36
 - Pennsylvania, 1992, 93:6.29
- Toys
 - Illinois, 91:1.29
 - Ohio, Nov. 13, 1996, 97:6.54
- Trucks, Texas, 1993, 94:4.29
- Variety
 - Missouri, 1996, 97:6.22
 - Texas, July, 1995, 96:6.70
- Warehouse store, Arizona, March 21, 1998, 98:4.49
- Warehouse stores present special hazards, need special attention, 98:1.50, 4.44
- STRONACH, IAN**
 - Profile of, 98:5.33
- STRUCTURAL COLLAPSE**
 - Allows fire spread, 92:4.71
 - Fire fighter fatalities related to, 70, 93:4.69, 94:4.57, 64, 67, 97:4.54, 58, 98:4.59
 - Fire fighter injuries related to, 91:6.49, 52, 92:6.61, 62, 64, 93:6.66, 94:6.63, 65, 97:6.73, 74, 98:5.45, 6.56
 - Hampers fire fighting, 98:5.18, 6.84
 - Athletic complex fire, 94:5.30
 - Automobile repair shop fire, 97:5.23
 - Manufacturing plant fire, 94:6.36, 94:6.94
 - Warehouse fire, 92:6.75, 97:6.56
- STRUCTURAL FIRE SAFETY**
 - Fire barriers in structural joints, 91:2.98
 - Fire hazards of contents, furnishings and interior finishes, 92:4.33
- STRUCTURES**
 - Fire fighter fatalities while operating inside, 95:4.84
- SUBWAY CAR FIRES**
 - Pennsylvania, 1990, 91:4.31
- SUBWAY FIRES**
 - Token booth, New York, 1995, 96:6.24
- SUPERMARKET FIRES. See STORE FIRES**
- SUPPRESSION SYSTEMS. See also SPRINKLER SYSTEMS**
 - Advances in systems and codes over thirty years, 96:5.75
 - Carbon dioxide, overpowered by fire, 94:6.94
 - Carbon dioxide shipboard system discharges, kills two, 96:2.83
 - Catastrophic fires, 94:1.05, 94:4.104
 - Dry chemical hood, activated after fire spread to duct, 96:5.25
 - Electrical generating plant large-loss fire spread limited by, 95:6.100

NFPA Journal
10 Year Index 1987-1997

Manual water spray system limits fire spread in chemical plant fire, 96:6.64
Water cannons control refinery fire, 96:5.96
Water mist systems, 94:3.46

T

TANK CARS, RAILROAD

Weyauwega, Wisc., LP-Gas tank car derailment, March 4, 1996, 96:3.89

TANK STORAGE FACILITIES FIRES

Catastrophic

Iowa, Dec. 13, 1994, 95:5.66
Kentucky, July 2, 1993, 94:5.104
Louisiana, March 11, 1990, 91:4.68
Missouri, Sept. 8, 1992, 93:5.67
Ohio, May 27, 1994, 95:5.66
Oklahoma, May 16, 1990, 91:4.69
Oklahoma, Apr. 23, 1995, 96:5.97
Colorado, Nov. 25, 1990, 91:6.73, 92:1.60
Fatal, Florida, 1990, 91:3.29
Georgia, April, 1995, 96:6.66
Pennsylvania, Oct., 1995, 96:6.62

TANK TRUCK FIRES

Catastrophic

Florida, March 17, 1993, 94:5.106
Mississippi, Jan. 20, 1992, 93:5.68
Missouri, April 16, 1990, 91:4.70
New York, May 20, 1991, 92:4.72
Tennessee, June 19, 1990, 91:4.70
West Virginia, May 11, 1993, 94:5.108

Fatal

California, 1995, 96:1.21
California, 1997, 98:2.19
Michigan, 1991, 92:6.29
Oregon, July, 1992, 93:6.84
Pennsylvania, 1992, 93:3.36
Space program technology applied to tank truck fires by NASA, NFPA, Chicago Fire Dept. partnership, 98:2.52
Tennessee, 1992, 93:6.30

TANKER VESSELS

Fire safety, 98:3.70

TANKS, DIPPING

Bonderizing tank liquid overheats, ignites, 98:3.42

TAR

Hot tar ignites roof, 91:6.23
Hot tar ignites roof framing, 98:2.19
Residue in floor boards spreads fire, 93:6.83
Roofing tar spreads fire, 94:6.93, 94, 95

TAR KETTLE FIRES

Illinois, 1990, 91:6.23
Oklahoma, 1996, 97:3.33

TAVERN FIRES. See RESTAURANT FIRES

TENNESSEE

Board and care facility fire, Feb. 8, 1996, 97:5.52
Catastrophic fires
Dwelling, March 9, 1991, 92:4.67
Dwelling, March 31, 1992, 93:5.62

NFPA Journal
10 Year Index 1987-1997

- Dwelling, Apr. 13, 1996, 97:5.49
- Manufactured home fire, March 4, 1994, 95:5.56
- Motor home fire, Aug. 14, 1992, 93:5.68
- Motor vehicle/railroad rolling stock fire, June 19, 1990, 91:4.70
- Motor vehicle fire, Dec. 11, 1990, 91:4.70
- Motor vehicle fire, Nov. 11, 1994, 95:5.68
- Motor vehicle, Apr. 3, 1997, 98:5.55
- Storage and manufacturing facility, June 5, 1997, 98:5.53
- Church fire, 1992, 93:6.30
- Detention facility fire, June 26, 1977, 94:5.50
- Fatal board and care facility fire, February 8, 1996, fire investigation report, 98:5.38
- Hospital fire, 1991, 92:5.25
- Manufacturing plant fire, Sep. 18, 1997, 98:6.85
- Nursing home fire, April 25, 1994, 95:2.85
- Restaurant fire, 1997, 98:5.18
- Secondary school fire, 1993, 94:2.30
- Stores, museum, amusement center fire, July, 1992, 93:6.81
- Store fire, Oct., 1993, 94:6.91
- Store fire, May 23, 1996, 97:6.54
- Warehouse fire, 1990, 91:5.25
- TERMINAL FIRES**
- New York, Sept., 1991, 92:6.76
- TERRORISM**
- Airport security measures jeopardize life safety, 96:6.85
- Bomb site, fire fighter injuries related to, 98:6.54
- Emergency response preparedness for, 96:1.54
- Emergency response training funded by Domestic Preparedness Act, 98:1.38
- Explosion and fire caused by, Murrah Federal Building, Oklahoma City, Okla., Apr. 19, 1995, 96:1.50, 59, 96:5.94, 96:6.69
- Explosion and fire caused by, Sandy Springs, Georgia, Jan. 12, 1997, 97:3.52
- Explosion and fire caused by, World Trade Center, New York, N. Y., Feb. 26, 1993, 93:6.91, 94:5.104, 94:6.90, 95:2.59
- Federal program trains first responders for terrorist attacks, 98:6.31
- Fire service preparation for attacks, 97:3.52
- Fire services must be prepared for terrorist attacks, 96:2.35
- USAR task force response to Murrah Federal Building bombing, 96:1.59
- TEST FACILITIES FIRES**
- Rocket fuel propellants, California, 1994, 95:4.40
- TESTA, WILLIAM L.**
- Profile of, 94:6.27
- TEXAS**
- Aircraft crash fire, April, 1993, 94:6.98
- Apartment building fire, 1996, 97:2.22
- Apartment building fire, Jan. 16, 1997, 98:6.90
- Catastrophic fires
- Aircraft explosion, Sept. 11, 1991, 92:4.72
- Apartment building, Aug. 21, 1993, 94:5.100
- Automobile, July 12, 1993, 94:5.108
- Board and care facility, Apr. 11, 1993, 94:5.105
- Dormitory, Apr. 19, 1993, 94:5.95
- Dwelling, Oct. 7, 1991, 92:4.68
- Dwelling, Feb. 2, 1995, 96:5.92
- Dwelling, July 22, 1995, 96:5.92
- Dwelling, Oct. 21, 1995, 96:5.93

NFPA Journal
10 Year Index 1987-1997

Group home, March 24, 1991, 92:4.70
Manufacturing plant, July 5, 1990, 91:4.67
Motor vehicle, Jan. 18, 1994, 95:5.68
Ship, Oct. 9, 1993, 94:5.108
Storage facility, April 7, 1992, 93:5.67
Vacant dwelling, Nov. 12, 1990, 91:4.68
Chemical warehouse fire, 1990, 91:6.26
Church fire, 1992, 93:6.30
Church fire, 1996, 97:1.27
College laboratory fire, 1996, 97:5.23
Condominium fire, Dec. 14, 1996, 97:6.58
Dwelling fire, 1995, 96:5.25
Dwellings, multiple, fire, 1995, 96:4.21
Dwelling fire, March 20, 1997, 98:6.90
Fatal fires
Board and care facility, Aug. 13, 1990, 91:4.68
Dwelling, 1994, 95:2.29
Dwelling, 1997, 98:5.17
Hotel, 1996, 97:4.19
Laboratory, 1991, 92:5.28
Manufacturing plant, 1996, 97:2.24
School explosion, March 18, 1937, 93:5.94
Shed, 1992, 93:2.20
Storage facility, April, 1992, 93:6.87
Grass fire, 1991, 92:2.28
Ink manufacturing plant fire, 1992, 93:1.28
Manufacturing plant fire, 1990, 91:6.24
Manufacturing plant fire, July 5, 1990, 91:6.78
Manufacturing plant fire, March, 1991, 92:6.75
Manufacturing plant fire, June, 1991, 92:6.79
Manufacturing plant fire, Jan., 1992, 93:6.83
Manufacturing plant fire, July, 1993, 94:6.94
Manufacturing plant fire, Oct., 1994, 95:6.102, 108
Manufacturing plant fire, 1995, 96:6.23
Manufacturing plant fire, July, 1995, 96:6.64
Manufacturing plant fire, Aug., 1995, 96:6.64
Manufacturing plant fire, Apr. 23, 1996, 97:6.49
Manufacturing plant fire, Jan. 31, 1997, 98:6.86
Manufacturing plant fire, June 29, 1997, 98:6.85
Manufacturing plant fire, Aug. 28, 1997, 98:6.87
Motor vehicle repair shop fire, 1990, 91:2.31
Nightclub fire, 1991, 92:6.25
Office building/warehouse fire, Oct., 1994, 95:6.99
Prescribed burn spreads beyond containment, 1994, 95:2.31
Railroad rolling stock fire, Oct. 25, 1997, 98:6.91
Refinery fire, April, 1991, 92:6.75
Ship fire, Nov. 11, 1997, 98:6.91
Special property fire, 1993, 94:4.29
Storage facility fire, 1994, 95:1.31, 95:6.38
Storage facility fire, June/July, 1995, 96:6.66
Store fire, July, 1995, 96:6.70
Store fire, Sept., 1995, 96:6.72
Utility company transformer fire, 1997, 98:1.22
Warehouse fire, 1993, 94:4.32

NFPA Journal
10 Year Index 1987-1997

Warehouse fire, June, 1993, 94:6.96
Warehouse fire, Nov., 1993, 94:6.95
Warehouse fire, July, 1994, 95:6.108
Warehouse fire, 1997, 98:5.18
Wildland fire, 1994, 95:2.31

THAILAND

Catastrophic manufacturing plant fire, May 10, 1993, 94:1.42
Royal Jomtien hotel fire, July 11, 1997, fire investigation report, 98:2.34

THEATER FIRES

California, 1995, 96:1.24
California, 1996, 97:3.29
Florida, 1995, 96:2.26
Iroquois Theatre fire, Chicago, Ill., Dec. 30, 1903, 95:4.75

THERMAL ENERGY GENERATING PLANT FIRES

Catastrophic, New Jersey, Dec. 25, 1992, 93:5.67

THOMAS, H. EMERSON

Interview with, 95:5.86
Profile of, 98:6.39

THROUGH-PENETRATION PROTECTION SYSTEMS

Update on systems, 94:1.54

TIRE FIRES

Hagersville, Ont., 1990, 91:1.50
Pennsylvania, March 13, 1996, 97:6.59
Saint Amable, Que., 1990, 91:1.55

TORCHES

ABS piping ignited by, 91:6.73
Acetylene
 Concealed space fire ignited by, 94:6.93
 Ethyl alcohol vapors ignited by, 93:5.67
 Plastic greenhouse cover ignited by, 92:4.25
Butane, ignites insulation materials, 96:1.22
Cutting
 Ammonium nitrate powder ignited by, 94:5.105
 Cardboard, plywood ignited by, 95:6.104
 Cardboard ignited by, 94:6.97
 Carpets ignited by, 94:6.97
 Ceiling material ignited by, 95:6.108
 Foam insulation ignited by, 98:6.84
 Gasoline vapors ignited by, 95:6.38
 Hot metal filings ignite insulation, 97:2.23
 Methane gas vapors ignited by, 93:5.67, 93:6.82
 Slag and hot metal ignite combustibles, 97:3.29
 Slag ignites paper and insulation, 97:5.52, 6.59
 Wood ignited by, 95:5.35
Hot slag from torches ignites plastic modules, 93:5.67
Hydraulic oil residue ignited by, 92:3.32
Newspaper, ignites wood joists, 94:5.96
Oil well explosion and fire, possible cause of, 92:4.71
Open-flame, ignites pipe insulation materials, 91:6.23
Plumber's, ignites structural wood framing, 98:3.42
Propane
 Combustible crates and plastic ignited by, 91:6.73
 Restaurant fire ignited by, 91:2.32
 Roof drain fire ignited by, 97:6.53

NFPA Journal
10 Year Index 1987-1997

Roof framing ignited by, 98:2.19

Roof ignited by, 97:6.19

Shingles, trim ignited by, 97:2.21

Roofing

Insulation ignited by, 95:3.40

Roof ignited by, 94:3.29, 94:6.95, 95:6.98, 96:6.73, 97:2.21, 6.19, 53

Wooden roof members ignited by, 94:6.96

Spark ignites rubber seal, 93:6.85

Welding

Electric, ignites residual plastic in shredder, 96:5.23

Polyurethane mats ignited by, 94:5.30

PVC solvent vapors ignited by, 96:6.23

TORONTO, CANADA

Hazardous materials response teams, 92:1.38

Large-loss-of-life fire, S. S. Noronic, Toronto, Canada, Sept. 17, 1949, 97:1.58

TOWNHOUSE FIRES. See APARTMENT BUILDING FIRES

TOXICITY, COMBUSTION

Review of major issues concerning toxicity, 96:6.90

TRAILERS, CAMPING. See CAMPING TRAILER FIRES

TRAINS. See RAILROAD ROLLING STOCK FIRES

TRANSFORMER FIRES

Texas, 1997, 98:1.22

TRANSFORMERS

Polychlorinated biphenyls (PCBs) in, 91:1.116

TRASH. See RUBBISH AND TRASH

TRENCH, NANCY J.

Profile of, 93:3.21

TRIANGLE SHIRTWAIST CO. FIRE

Outrage, reform as results, 93:3.72

TRUCK FIRES. See also TANK TRUCK FIRES

California, 1991, 92:6.26

Catastrophic

Arkansas, Jan. 9, 1995, 96:5.99

California, Jan. 23, 1990, 91:4.70

California, Dec. 25, 1991, 92:4.73

California, March 3, 1994, 95:5.68

California, June 23, 1995, 96:5.100

California, June 27, 1995, 96:5.100

California, Sept. 9, 1995, 96:5.100

Georgia, Apr. 3, 1996, 97:5.54

Indiana, March 20, 1993, 94:5.106

Maryland, Jan. 16, 1993, 94:5.108

Missouri, April 16, 1990, 91:4.70

New York, May 20, 1991, 92:4.72

Ohio, Dec. 4, 1992, 93:5.68

Tennessee, June 19, 1990, 91:4.70

Tennessee, Nov. 11, 1994, 95:5.68

Texas, Jan. 18, 1994, 95:5.68

West Virginia, July 26, 1990, 91:4.69

Wisconsin, Nov. 11, 1994, 95:5.67

Catastrophic fires

California, May 4, 1997, 98:5.55

Idaho, July 4, 1997, 98:5.55

Kansas, Dec. 22, 1997, 98:5.56

NFPA Journal
10 Year Index 1987-1997

Oregon, March 25, 1997, 98:5.55

Tennessee, April 3, 1997, 98:5.55

Fatal

California, 1995, 96:1.21

Massachusetts, 1996, 97:5.24

Illinois, Aug., 1993; tractor trailer, 94:6.96

Michigan, 1991, 92:6.29

Michigan, 1993, 94:6.34

Oklahoma, 1996, 97:3.33

Pennsylvania, 1992, 93:1.28

South Carolina, 1990; pickup truck crash triggers fuel storage fire, 91:2.32

Texas, 1993; alternative fuel pick-up, 94:4.29

TUNNELS

In entertainment facility, fire spread through, 98:6.92

Eurotunnel (Channel tunnel) fire, November 18, 1996, analysis, 97:2.58

Fire protection for Eurotunnel (Channel tunnel), 96:1.85

U

UNDERGROUND STRUCTURES. *See also* TUNNELS

Electrical vault, catastrophic fire in, 91:4.69

SubTropolis storage/manufacturing facility, Kansas City, Missouri, requires unique fire protection measures, 98:6.68

UNDERWRITERS LABORATORIES, INC.

NFPA 72, *The National Fire Alarm Code*, and UL standards work together, 93:5.25

UNITED STATES

Arson fires: types of fires and firesetters, 98:6.58

Catastrophic fires

1990, 91:4.60

1991, 92:4.62

1992, 93:5.56

1993, 94:5.88

1994, 95:5.48

1995, 96:5.86

1996, 97:5.46

1997, 98:5.42

Fire deaths (*See* FIRE DEATHS, U. S.)

Fire departments, NFPA survey, 93:4.59

Fire fighter fatalities

1990, 91:4.46

1991, 92:4.40

1992, 93:4.44

1993, 94:4.55

1994, 95:4.83

1995, 96:4.63

1996, 97:4.46

1997, 98:4.50

Fire fighter injuries

1990, 91:6.42

1991, 92:6.56

1992, 93:6.56

1993, 94:6.57

1994, 95:6.63

1995, 96:6.103

1996, 97:6.66

1997, 98:6.48

NFPA Journal
10 Year Index 1987-1997

Fire losses (*See also* subentry: Fireworks, losses and casualties caused by)

1990, 91:5.36

1991, 92:5.32

1992, 93:5.78

1993, 94:5.57

1994, 95:5.93

1995, 96:5.52

1996, 97:5.76

1997, 98:5.72

Fireworks, losses and casualties caused by, 92:4.56, 93:4.55, 94:4.78, 95:4.61,
96:4.79, 97:4.78

Large-loss fires

1990, 91:6.28

1991, 92:6.40

1992, 93:6.73

1993, 94:6.84

1994, 95:6.94

1995, 96:6.58

1996, 97:6.44

1997, 98:6.80

History of study, 95:5.87

Smoke detector experience of, 94:5.36

Sprinkler use, 93:6.44

UNITED STATES GOVERNMENT. *See also* INSIDE THE BELTWAY COLUMNS

Bureau of Alcohol, Tobacco, and Firearms National Response Teams aid in catastrophic
fire investigations, 98:3.92

Congress considers natural disaster relief policy reform, 97:5.31

Contract with America's effect on fire service and fire safety, 95:3.46

Department of Energy adopts performance-based codes, 97:3.94

Federal Communications Commission provides emergency radio frequencies, establishes
311 number, 97:4.29

Federal haz-mat response critiqued, 95:1.19

Federal haz-mat response needs simplification, standardization, 95:3.27

FEMA's disaster management role, 95:4.46

National reporting systems, including NFIRS, for fire investigations, 98:3.80

Regulatory reform poses dangers, 97:3.41

Technology Transfer Act helps, but not all federal agencies update regulatory references
to NFPA standards, 97:6.29

U. S. agencies required to use voluntary consensus standards, 96:6.40

U. S. Treasury Building fire indicated life safety deficiencies, 96:6.52

UNIVERSITY BUILDING FIRES. *See* COLLEGE BUILDING FIRES

UP TO CODE COLUMNS

Passive fire protection systems, 97:2.30

Revised sprinkler standard has more information in an accessible format, 97:1.34

UPS (uninterruptible power supply)

Fighting fires in system, 94:5.33

URBAN FIRE FORUM

Global trends discussed at fifth forum, 95:1.104

UTAH

Apartment building fire, 1994, 95:6.36

Apartment building fire, 1995, 96:2.23

Catastrophic fires

Aircraft, July 9, 1992, 93:5.68

Dwellings, Nov. 18, 1992, 93:5.64

NFPA Journal
10 Year Index 1987-1997

Dwelling fire, Dec., 1993, 94:6.90
Fatal fires
 Apartment building, 1996, 97:5.21
 Dwelling, 1997, 98:6.23
Furniture manufacturing plant fire, 1990, 91:2.31
Manufacturing plant fire, 1990, 91:5.28
Manufacturing plant fire, 1993, 94:3.29
Manufacturing plant fire, Feb. 1, 1997, 98:6.86
Nursing home fire, 1991, 92:4.27
Office building fire, 1990, 91:2.30
Office building fire, 1994, 95:3.40
Public assembly building fire, 1991, 92:1.23
Refinery fire, 1993, 94:6.36
School fire, March, 1995, 96:6.73

UTILITIES. See also ELECTRIC GENERATING PLANT FIRES; POWER PLANT FIRES

Electricity shut off, factor in fatal fire, 98:5.17
Electricity shut off for nonpayment, catastrophic fire factor, 94:5.97, 95:5.53
Electricity shut off for nonpayment, fatal fire factor, 96:6.22
Electricity shut off for repair, catastrophic fire factor, 95:5.59
Gas shut off for nonpayment, catastrophic fire factor, 94:5.96
Illegally supplied power to dwelling, factor in catastrophic fire, 97:5.51
Transformer fire, Texas, 1997, 98:1.22
Water shut off for nonpayment, catastrophic fire factor, 94:5.96

V

VACANT BUILDING FIRES

Bowling alley, Michigan, 1991, 92:2.29
Catastrophic
 Club, Georgia, Dec. 12, 1990, 91:4.68
 Department store, California, Oct. 22, 1991, 92:4.71
 Dwelling, California, July 22, 1990, 91:4.67
 Dwelling, Maryland, March 1, 1990, 91:4.67
 Dwelling, Pennsylvania, Aug. 1, 1992, 93:5.67
 Dwelling, Texas, Nov. 12, 1990, 91:4.68
Manufacturing mill complex, New York, Dec., 1993, 94:6.98
Manufacturing plant, Alaska, April 25, 1997, 98:6.92
Manufacturing plant, New York, 1995, 96:5.26
School, Virginia, 1995, 96:5.25

VAGRANTS

Victim of catastrophic fire, 92:4.69

VAN FIRES. See TRUCK FIRES

VANCOUVER, WASH.

Emergency response system analysis and enhancement program, 91:1.78

VAPOR CLOUD

Ignited, cause of explosion, fire, 93:5.68
Ignited by heat source, cause of explosion, fire, 91:6.74
Ignited by unknown source, cause of explosion, fire, 93:5.67, 93:6.87
Ignited by unknown source, cause of fire, 93:6.82
Ignited by utility pole transformer, cause of explosion, fire, 93:6.30

VAPORS, FLAMMABLE. See also GAS FIRES

Aircraft fuel vapors ignited by molten copper, 94:5.106
Crude oil vapors ignited by cigarette lighter, catastrophic fire cause, 91:4.69
Crude oil vapors ignited by open flame, catastrophic fire cause, 91:4.68
Cutting operation ignited, 91:4.68

NFPA Journal
10 Year Index 1987-1997

Ethyl alcohol vapors, ignited by torch in tank storage fire, 93:5.67
Flammable liquid vapors ignite flash fire, 94:5.29
Floor stripper vapors ignited, 94:5.105
Gasoline vapors, cause of fire/explosion at tank/storage facility, 91:3.29
Lacquer thinner vapors ignited by pilot light, 94:5.104
Methane vapors, ignited by torch in mine fire, 93:5.67, 93:6.82
Methyl t-butyl ether vapors ignite, causes flash fire, 93:6.27
Oil vapors ignited by cigarette lighter, 94:5.104
Pentane vapors, ignited by electrical arc from forklift controls, 91:6.26
Pentane vapors ignited by hot plate, 92:3.33
Solvent vapors ignited by spark from forklift, 92:4.28
Varnish remover vapors ignited by spark, 91:6.24

VAULTS

Electrical arc fire, in belowgrade room, 95:5.35

VEHICLES

Natural gas fueled, handling incidents involving, 94:4.84

VEHICLE ACCIDENTS. See also AUTOMOBILE FIRES; RAILROAD ROLLING STOCK FIRES; TRUCK FIRES

Fire fighter fatalities related to, 96:4.72, 74, 97:4.51, 98:4.61, 62

Fire fighter injuries related to, 96:6.107, 97:6.69, 73, 76, 98:6.55

VEHICLE FIRES. See also AIRCRAFT CRASH FIRES; AUTOMOBILE FIRES; FORKLIFT FIRES; RAILROAD ROLLING STOCK FIRES; SHIP FIRES; TRUCK FIRES

Alternative-fuel vehicle, 94:4.29

Bomb explosion ignites multiple vehicles, 94:5.104, 94:6.90

Bus, 92:4.26

Catastrophic, California, June 23, 1995, 96:5.100

Fire losses show significance of vehicle fires, 96:5.79

Fire statistics and fire safety information, 98:2.88

Forklift hits aerosol containers which explode, 96:4.23

Gondola car, 94:3.28

Statistics compared to aircraft fire statistics, 95:4.120

Subway car, 91:4.31

Vehicle ignited at vehicle conversion facility, 96:6.65

Vehicles ignite wildland fires, 93:6.89

VENTILATION

Closed windows allow vapors to accumulate, 94:5.104, 105

Fire spread by, 94:5.97, 98:5.49

Inadequate

Boat fire factor, 91:4.31

Warehouse fire factor, 93:6.87

Lack of sidewall openings, roof vents hampered ventilation, 98:6.91

Smoldering fire intensified by, 98:4.21

Window fan, in operation, helps spread fire, 98:4.19

Window lexan layer hard to penetrate, 94:6.89

VENTILATION SYSTEMS. See also DUCTS; HVAC SYSTEMS

Air handler units factor in fire spread, 97:3.33

Fire spread through, 96:6.72, 98:6.85

VENTS

Fire spread through, 96:6.64

VERMONT

Board and care facilities fire, 1995, 96:3.36

Fatal apartment building fire, 1996, 97:2.22

Multiple-occupancy/dwelling fire, 1989, 91:1.27

NFPA Journal
10 Year Index 1987-1997

VERTICAL FIRE SPREAD

High-rise office building fire, 91:5.64

VERTICAL OPENINGS. See also STAIRWAYS

Catastrophic fires spread up stairway, 96:5.92

Fire spread through, 93:1.29, 93:5.66, 95:5.33

VIDAL, DAVID J.

Profile of, 93:4.19

VIRGINIA

Apartment building fire, 1992, 93:3.35

Apartment building fire, 1993, 94:3.28

Apartment building fire, 1997, 98:5.15, 6.22

Catastrophic fires

Aircraft, Sept. 10, 1995, 96:5.99

Automobile, Aug. 1, 1994, 95:5.68

Coal mine, Dec. 7, 1992, 93:5.66

Dwelling, Jan. 20, 1996, 97:5.50

Dwelling, May 15, 1996, 97:5.50

Dwelling, July 8, 1996, 97:5.51

Dwelling, Sept. 10, 1996, 96:5.99

Dwelling, Nov. 19, 1997, 98:5.46

Hospital, Dec. 31, 1994, 95:5.64

Church fire, July, 1994, 95:6.98

Manufacturing plant fire, Nov., 1992, 93:6.82

Manufacturing plant fire, Feb., 1993, 94:6.93

Manufacturing plant fire, April, 1995, 96:6.63

Manufacturing plant fire, 1996, 97:4.22

Manufacturing plant fire, Sept. 1, 1996, 97:6.50

Office building fire, 1991, 92:2.25

Power plant fire, Feb., 1995, 96:6.72

Restaurant fire, 1995, 96:3.36

Restaurant fire, 1996, 97:2.21

School fire, 1995, 96:5.25

Warehouse fire, 1990, 91:5.25

Warehouse fire, April, 1992, 93:6.86

Warehouse fire, 1994, 95:2.30

VOIDS. See CONCEALED SPACES

VOLUNTEER FIRE SERVICE. See also VOLUNTEER VIEWS COLUMNS

Contracting with municipal fire department, Austin, Tex., 91:2.104

NFPA's *Volunteer Firemen* magazine, 95:5.90

Recruiting and retaining volunteers, Elsmere Volunteer Fire Department, N. Y., 91:4.82

Volunteer Protection Act of 1997 protects volunteers from liability, 98:2.27

VOLUNTEER VIEWS COLUMNS

Administrative officer's role, 91:2.114

Analyze risk before risking lives, 95:1.21

Apply mutual aid to fire investigations, 93:1.12

Are professionalism and fun compatible?, 92:6.22

Change required for survival, 91:1.114

Changes in fire services difficult, but necessary, 94:4.20

Combination career/volunteer departments, 91:3.36

Discipline promotes effective performance, 93:2.85

Encouraging participation in fire service organizations, 93:3.136

Financial incentives to improve recruitment, retention, 95:2.21

Fire service leaders should lead by example, 93:4.83

Fireground behavior after fire is out, 95:6.26

NFPA Journal
10 Year Index 1987-1997

Flexibility, technology meet increased need for training, 94:5.18
Future of fire service funding, 93:5.120
Importance of NFPA standards to fire service, 92:3.36
Insurance Services Office rates alternate water supplies, 91:5.83
Membership evaluation of fire department, 95:4.28
Membership input to department decisions, 94:1.20
NFPA Volunteers in Transition Conference, July, 1990, report on, 91:6.20
Participatory management enhances morale, 92:1.96
Personal protective gear's improved thermal protection increases heat stress, 93:6.17
Pride keeps morale high, 94:3.18
Public information officer can improve media coverage, 94:6.20
Reconciling fire fighter safety and customer service needs, 92:4.86
Records and department historian preserve the past, 95:3.28
Recruiting a new generation of volunteers, 95:5.24
Recruiting and retaining volunteers, 94:2.20

W

WACO, TEXAS

Branch Davidian complex fire investigation, Congressional testimony, 95:6.91

WALLS

Collapse, in catastrophic dwelling fire, 97:5.50
Collapsed, hamper fire fighting, 91:6.37, 92:6.78, 95:6.103, 95:6.107, 96:6.70
Combustible, fire spread through, 91:6.75
Cripple wall burns, causes floor collapse, 96:5.96
Fiberglass, fueled fire, 91:6.75
Fire spread within, 92:6.79, 96:2.24

WALLS, FIRE

Catastrophic fire contained by, 91:4.64, 67
Concrete, fire spread through doors in, 91:6.75
Contained fire spread, 93:1.28, 93:6.82, 93:6.87, 94:5.30, 98, 102, 105, 94:6.93, 97,
95:5.34, 95:6.38, 104, 98:2.18, 5.16, 98:6.92
Damaged, factor in fire spread, 97:5.24, 6.56
Explosion rips open, 94:6.90
Failed, allowed fire spread, 98:6.88
Fire spread over, 94:6.93
Inadequate, fire spread to roof, 91:5.26
Lack of, allowed fire spread in manufacturing plant fire, 93:6.83
Lack of, allowed fire spread in sawmill fire, 92:6.79
Lack of, factor in fire spread, 97:6.56
Penetrations in wall, fire spread through, 98:2.20
Unprotected openings allowed fire spread, 93:6.86, 95:6.103

WAREHOUSES

Sprinkler system design, 93:4.16
Underground SubTropolis facility, Kansas City, Missouri, requires unique fire
protection measures, 98:6.68

WAREHOUSE FIRES. See also STORAGE FACILITIES FIRES

Adhesive materials, California, 1990, 91:6.26
Agricultural products, Jan., 1995, 96:6.68
Aircraft parts, Missouri, 1991, 92:6.26
Automotive parts
Michigan, 1997, 98:6.24
Michigan, Dec., 1992, 93:6.87
North Carolina, Aug. 12, 1997, 98:6.88
Bottles, Colorado, Nov., 1992, 93:6.87
California, 1991, 92:1.23

NFPA Journal
10 Year Index 1987-1997

Carpet

Georgia, April, 1993, 94:6.97
Georgia, March, 1993, 94:6.97
Texas, 1993, 94:4.32

Chemicals

North Carolina, 1992, 93:2.21
Texas, 1990, 91:6.26

Clothing, Pennsylvania, 92:2.27

Cold storage

California, Sept. 25, 1996, 97:6.57
Illinois, Aug., 1993, 94:6.96
Missouri, March, 1992, 93:6.85
Oregon, 1993, 94:3.27
Texas, 1994, 95:6.108
Washington, Oct., 1992, 93:6.85
Wisconsin, May, 1991, 92:6.75
Wisconsin, May 3, 1991, 91:6.37

Cosmetics

New York, 1993, 94:1.30
Virginia, 1990, 91:5.25

Cotton

Missouri, Feb. 24, 1997, 98:6.88
Missouri, March 16, 1997, 98:6.87

Coupon clearing house products, Iowa, April, 1995, 96:6.66

Fertilizer, Virginia, April, 1992, 93:6.86

Fiberglass products

Alabama, 1992, 93:4.26
New Jersey, 1989, 91:2.33

Flammable and combustible liquids tanks, Iowa, Feb., 1995, 96:6.68

Flooring, Texas, 1993, 94:4.32

Foam products, Iowa, 1997, 98:1.25

Food

Arizona, Nov., 1992, 93:6.86
California, 1991, 93:1.28
California, 1996, 97:3.34
Louisiana, Aug. 24, 1990, 91:6.73
Washington, Jan. 5, 1995, 96:5.96

Furniture

Georgia, March, 1993, 94:6.97
Illinois, 1994, 95:3.38
North Carolina, 1994, 95:6.38

General

Alabama, Oct. 2, 1997, 98:6.88
Indiana, April, 1992, 93:6.87
Indiana, Oct. 8, 1996, 97:6.57
Louisiana, March 21, 1996, 97:6.54
Massachusetts, Jan., 1992, 93:6.84
Massachusetts, 1994, 95:1.32
Michigan, Oct. 16, 1996, 97:6.56
New Jersey, Jan. 10, 1996, 97:6.56
Pennsylvania, Aug., 1992, 93:6.85
Rhode Island, May, 1992, 93:6.86
Rhode Island, 1994, 95:3.39
Virginia, 1994, 95:2.30

NFPA Journal
10 Year Index 1987-1997

- Hawaii, 1989, 91:1.31
- Heating and air conditioning supply, Nebraska, Apr. 12, 1996, 97:6.57
- Hops, Washington, Sept., 1993, 94:6.97
- Household goods, South Carolina, Feb. 10, 1997, 98:6.88
- Indiana, March 18, 1997, 98:6.88
- Leather, Oklahoma, 1990, 91:4.26
- Magazines, Illinois, Jan., 1993, 94:6.96
- Metal products, Tennessee, 1990, 91:5.25
- Michigan, 1995, 96:3.39
- Minnesota, July, 1995, 96:6.66
- Ohio, Jan., 1994, 95:6.110
- Paint, California, 1992, 93:4.26
- Paper
 - Florida, 1995, 96:1.24
 - Illinois, Oct. 29, 1996; paper records, 97:6.56
 - Massachusetts, Nov., 1993, 94:6.97
 - Michigan, 1993, 94:6.34
 - Texas, Nov., 1993, 94:6.95
- Peanuts, Texas, June, 1993, 94:6.96
- Pharmaceuticals, New York, 1993, 94:1.30
- Picture tubes, Indiana, July, 1993, 94:6.96
- Plastics
 - Florida, 1995, 96:1.24
 - Pennsylvania, Aug. 27, 1996, 97:6.56
- Plumbing and electrical supplies, Georgia, May, 1992, 93:6.86
- Promotional items, Iowa, April 22, 1997, 98:6.87
- Refrigerated, Colorado, July 23, 1997, 98:6.87
- Retail goods
 - Kansas, 1994, 95:4.39
 - Washington, 1995, 96:4.23
- Rubber, Louisiana, Aug. 24, 1990, 91:6.73
- Secondhand goods, Michigan, Dec., 1995, 96:6.69
- Siding, Texas, 1993, 94:4.32
- Texas, 1997, 98:5.18
- Texas, Oct., 1994, 95:6.99
- Tobacco
 - North Carolina, April, 1992, 93:6.87
 - North Carolina, Sep. 29, 1997, 98:6.87
- Vehicles, California, 1996, 97:6.23
- Warehouse stores present special hazards, need special attention, 98:1.50, 4.44
- Wood products, Washington, Sept., 1992, 93:6.86
- WARMING FIRES**
 - Catastrophic fire cause, 91:4.68, 69
- WASHINGTON**
 - Apartment building fire, 1995, 96:1.22
 - Apartment building fire, 1996, 97:1.25
 - Apartment building fire, 1997, 98:6.23
 - Arsonists use pyrotechnic accelerants to ignite series of fires, 92:6.67
 - Barracks/club fire, May 11, 1990, 91:6.77
 - Catastrophic fires
 - Dwelling, Dec. 17, 1992, 93:5.66
 - Dwelling, Apr. 7, 1995, 96:5.91
 - Dwelling, May 31, 1996, 97:5.49
 - Manufactured home, Aug. 8, 1990, 91:4.65

NFPA Journal
10 Year Index 1987-1997

- Manufacturing plant/warehouse, Jan. 5, 1995, 96:5.96
- Fatal fires
 - Apartment building, Nov. 13, 1997, 98:6.90
 - Automobile repair shop, 1995, 96:6.21
 - Board and care facility, April 27, 1998, fire investigation report, 98:5.34
 - Dwelling, 1994, 95:6.36
 - Grain mill and storage facility, 1991, 92:4.28
 - Wildland/urban interface, July, 1994, 95:6.111
- Group home fire, 1992, 93:1.25
- Manufactured home fire, 1996, 97:3.30
- Manufacturing plant fire, Jan., 1993, 94:6.95
- Manufacturing plant fire, Sept. 1, 1996, 97:6.49
- Marina fire, 1990, 92:1.26
- Nursing home fire, 1995, 96:4.24
- Office building fire, 1993, 94:2.29
- Ship fire, Sept. 16, 1991, 92:6.48
- Storage facility fire, March, 1995, 96:6.68
- Store fire, 1990, 92:3.32
- Warehouse fire, Sept., 1992, 93:6.86
- Warehouse fire, Oct., 1992, 93:6.85
- Warehouse fire, Sept., 1993, 94:6.97
- Warehouse fire, 1995, 96:4.23
- Warehouse under renovation fire, 1990, 91:4.31
- Wildland/urban interface fire, Sept., 1992, 93:6.89
- Wildland/urban interface fire, July, 1994, 95:2.48, 95:6.111
- WASHINGTON, D. C.
 - Airports equipped with state-of-art fire protection and security systems, 98:4.80
 - Catastrophic dwelling fire, Jan. 7, 1993, 94:5.97
 - Dormitory fire, 1990, 91:4.25
 - United States Treasury Building fire, June 26, 1996, 96:6.52, 97:6.53
- WASTEWATER TREATMENT PLANTS
 - Fire protection, 91:1.44
- WATER MIST SUPPRESSION SYSTEMS
 - Design principles of system, 94:3.46
- WATER SPRAY SYSTEMS
 - Manual system limits fire spread in chemical plant fire, 96:6.64
- WATER SUPPLY
 - Alternative supplies rated by Insurance Services Office, 91:5.83
 - Inadequate supply hampered fire service operations, 91:1.27, 54, 91:3.27, 91:4.26, 91:6.74, 75, 92:2.26, 92:4.25, 26, 97:5.24, 6.50, 56, 57, 58
 - Private fire service main installation, 97:3.37
 - Public, backflow prevention discussed by fire protection, water supply industries, 97:6.26
 - Public, preventing contamination by sprinkler system backflow, 97:4.68
 - Remote supply hampered fire service operations, 97:1.28, 6.59
 - Water storage problems hampered fire service operations, 91:6.73
 - Water supply disrupted by explosions hampered fire service operations, 91:6.74
- WAYSIDE INN FIRES
 - After two fires, suppression devices were installed, 94:6.75
- WEATHER
 - Drought (*See* DROUGHT)
 - Fire fighter fatalities related to, 98:4.61
 - Fire service operations hampered by (*See* FIRE SERVICE OPERATIONS HAMPERED)
 - Fire service response to Florida tornadoes, Feb. 22, 1998, 98:3.60

NFPA Journal
10 Year Index 1987-1997

Wind (*See* WIND)

WELDING AND CUTTING OPERATIONS. *See also* TORCHES

Apartment complex fire cause, 94:2.28
Cellulose insulation ignited by, 95:2.32
Conveyor belt ignited by sparks, 96:6.68
Cutting oil ignited by hot metal, 98:6.84
Fiber board insulation ignited by, 94:6.94
Flammable vapor ignited by, 91:4.68
Flammable vapors in refinery fire ignited by, 96:5.96
Foam insulation ignited by, 95:6.106
Food processing plant fire ignited by, 96:6.64
Grain elevator fire cause, 97:4.20
Grease residue ignited by, 93:6.85
Heat transferred to decaying plywood deck, 97:6.50
Hot slag from torch ignites paper, insulation, 97:6.59
Hot slag ignites foam insulation shavings, 98:4.21
Hot slag ignites food processing plant fire, 96:6.64
Hot slag ignites nut hulls in warehouse fire, 97:3.34
Hot slag on conveyor belt ignites food processing plant fire, 98:6.84
Leaking gas from welding equipment ignites explosion, 98:6.86
Paper wrapping ignited by, 95:3.39
Rubber curtain, dock seal ignited by, 97:6.56
Sawdust ignited by sparks, 91:4.31
Sparks ignite scenery, 98:6.92
Styrofoam insulation ignited by, 94:6.93
Tank farm fire ignited by, 96:6.62
Torch ignites ammonium nitrate powder, 94:5.105
Torch ignites cardboard, 94:6.97
Torch ignites cardboard, plywood, 95:6.104
Torch ignites carpets, 94:6.97
Torch ignites ceiling material, 95:6.108
Torch ignites foam insulation, 98:6.84
Torch ignites gasoline vapors, 95:6.38
Torch ignites polyurethane mats, 94:5.30
Torch ignites PVC solvent vapors, 96:6.23
Torch ignites wood, 95:5.35
Warehouse fire, possible cause of, 93:6.86

WELDON, CURT

Profile of, 91:3.14

WELLS, JACK

Interview with, 95:3.85, 95:4.97

WEST VIRGINIA

Catastrophic fires

Aircraft, Oct. 7, 1992, 93:5.68
Coal mine, March 19, 1992, 93:5.67
Dwelling, March 7, 1993, 94:5.96
Dwelling, Nov. 21, 1997, 98:5.50
Motor vehicle, July 26, 1990, 91:4.69
Truck, May 11, 1993, 94:5.108

Historic building fire, 1996, 97:6.22
Manufacturing plant fire, April, 1994, 95:6.102
Office building fire, March, 1995, 96:6.70
University building fire, 1993, 94:4.30

WET CHEMICAL EXTINGUISHING SYSTEMS

NFPA Journal
10 Year Index 1987-1997

- Nozzles blocked, failed to extinguish fire, 92:3.34
WEYAUWEGA, WISC.
LP-Gas railroad tank car derailment, March 4, 1996, 96:3.89
WEYMOUTH, MASS.
Hospital fire, Jan. 24, 1993, 93:5.49
WHARVES. *See* PIER AND WHARF FIRES
WILDFIRE MANAGEMENT COLUMNS
Brazilian delegation learns from Montana hotshot team, 93:6.32
Fire, ecological friend or foe of forests, 94:4.33
Hantavirus poses health threat to fire fighters, 94:2.31
Internet's fire protection applications, 95:6.41
Laughter as workplace morale booster, 91:2.116
National Interagency Incident Management System (NIMS), discussion, 91:3.123
NFPA 1051, *Wildland Fire Fighter Professional Qualifications*, approved, 95:5.39
NFPA standard for wildfire personnel qualifications, 94:1.33
NFPA survey, managers top concerns, 92:5.96, 93:2.83
NFPA survey, national issues, 92:2.66
NFPA survey identifies wildfire concerns, 92:1.74
Politics, media, and public relations addressed at meeting, 93:3.103
Rural fire protection: a shared responsibility, 94:5.35
Training needed to counteract stress, fear, and panic, 95:4.41
Wildland fire fighting rules to prevent fire fighter fatalities, 94:3.33
Wildland/urban interface, fire fighting problems at, 91:1.118
Wildland/urban interface, public safety education, 91:4.32
Working with the public to change policy, 93:5.20
WILDLAND FIRES. *See also* WILDFIRE MANAGEMENT COLUMNS
Fire season overview
1990, 91:1.59
1991, 92:1.54
1992, 93:1.36
1993, 94:2.79
1994, 95:2.36
1995, 96:2.45
1996, 97:2.46
1997, 98:2.42
Alaska, June 2, 1996, wildland/urban interface, 97:6.59
California, June 27, 1990, College Hills Fire, Glendale, 91:1.60
California, June 27, 1990, Los Padres National Forest, 91:1.61
California, Aug. 6, 1990, 91:6.74
California, Oct., 1991, 92:6.74
California, 1992, 93:4.28
California, Aug., 1992, 93:6.88
California, Aug., 1992, wildland/urban interface, 93:6.89
California, Sept., 1992, 93:6.88, 89
California, Oct., 1993, wildland/urban interface, 94:6.99
California, Nov., 1993, wildland/urban interface, 94:6.99
California, June, 1994, wildland/urban interface, 95:6.111
California, Aug., 1994, wildland/urban interface, 95:6.111
California, Aug. 13, 1997, 98:6.92
California, Sept. 27, 1997, wildland/urban interface, 98:6.92
Catastrophic
Arizona, 1990, Tonto National Forest, 91:1.60, 91:4.70, 91:6.78
California, Oct. 20, 1991, 92:4.72
California, Nov. 2, 1993, wildland/urban interface, 94:5.108

NFPA Journal
10 Year Index 1987-1997

Colorado, July 3, 1994, 95:5.67
Colorado, South Canyon, July, 1994, 95:2.51
Evacuations for California fires, 94:2.85
Fire fighter fatalities related to, 1994, 95:4.86, 87, 93
Fire fighter injuries related to, 97:6.76
Firefighter's first person account of Australian wildfire, 1996, 97:2.49
Firewise landscaping, 94:2.84
Florida, 1992, 93:3.36
Historical overview, 96:2.66
Homeowner responsibility for wildfire protection efforts, 94:2.4
Idaho, 1992, 93:4.26
Idaho, 1996, wildland/urban interface, 97:4.21
Kansas, Feb. 21, 1996, 97:6.59
Montana, Mann Gulch, 1949, 95:2.42
New Jersey, 1995, 96:2.26
New York, Aug., 1995, 96:6.74
NFPA codes and standards, 98:2.44
Oregon, Aug., 1992, 93:6.89
Oregon, Aug., 1994, wildland/urban interface, 95:6.111
Oregon, Oct., 1991, 92:6.76
Peshtigo, Wis., wildland/urban interface, 1871, 94:2.86
Surviving a wildland burnover, 98:2.47
Texas, 1994, 95:2.31
Washington, July, 1994, Fish Hatchery Complex, 95:2.48
Washington, July, 1994, wildland/urban interface, 95:6.111
Washington, Sept., 1992, wildland/urban interface, 93:6.89
Wildland/urban interface, fire fighting problems at, 91:1.118
Wildland/urban interface fire threat requires vigilance from homeowners and agencies, 98:6.94

WIND

Fire generated, contributes to wildland fire spread, 95:6.111
High, caused wall collapse in building-under-construction fire, 91:3.27
High, hampered fire fighting operations, 96:3.40, 97:6.57
High, intensified fire spread, 91:6.73, 74, 75, 92:4.25, 92:4.72, 92:5.25, 92:6.74, 76, 93:6.30, 81, 86, 88, 89, 94:2.28, 94:3.29, 94:5.108, 94:6.36, 90, 98, 99, 95:5.54, 67, 95:6.99, 96:2.24, 96:2.26, 96:5.93, 96:6.62, 69, 70, 74, 97:4.21, 6.50, 54, 56, 57, 59, 98:6.85, 90

WINDOWS

Blocked by air conditioner, factor in catastrophic fire, 98:5.45
Blocked by furniture, hinders escape in fatal fire, 94:6.33
Blocked by storage, door, catastrophic fire factor, 94:5.96
Broken by heat, catastrophic fire factor, 91:4.66
Closed windows allow vapors to accumulate, 94:5.104, 105
Conflict between security and fire safety, 94:3.110
Failed, factor in catastrophic fire, 68, 92:4.67
Failed, fire spread to interior through, 98:5.53
Fire vented through, 91:4.67, 93:5.62, 64, 94:5.28, 100, 102, 105, 94:6.34, 64, 95:5.53, 54, 56, 58, 59, 96:5.91, 96:6.70, 97:5.21, 49, 51, 52, 53, 6.20, 98:2.18
Furniture blocks access in catastrophic fire, 92:4.69
Glazing developments offer alternatives to wired glass, also raises code questions, 98:6.76
Inoperable, unbreakable, factor in catastrophic fire, 97:5.54
Lexan layer hampered ventilation, suppression, 94:6.89
Nailed shut, factor in catastrophic fire, 98:5.50

NFPA Journal
10 Year Index 1987-1997

Security bars, factor in catastrophic fire, 91:4.64, 96:5.93, 97:5.51, 98:5.45, 50
Security bars, factor in fatal fire, 91:4.26, 94:3.110, 94:5.95, 96, 95:2.29
Steel screens hinder escape in catastrophic fire, 93:5.62
Transom windows failed, factor in fire spread, 93:6.28

WINTERTHUR MUSEUM, DELAWARE

Life safety protection system, 92:5.63

WIRING, ELECTRICAL. See also ELECTRICAL FIRES

Faulty wiring short-circuits, ignites wood framing, 92:4.68
Inadequately sized, ignites wall, 91:4.67
Joist ignited by, 92:3.34
Malfunctioning or frayed wire ignites fire, 92:4.67
Short circuit ignites paneling, 92:2.28
U. S. cable/wire manufacturers promote NEC over IEC as European standard, 98:4.64

WISCONSIN

Catastrophic fires

Aircraft, Dec. 10, 1993, 94:5.106, 94:6.98
Board and care facility, Dec. 31, 1990, 91:4.69
Drilling rig, July 9, 1991, 92:4.72
Dwelling, March 13, 1990, 91:4.66
Dwelling, May 10, 1990, 91:4.65
Dwelling, Oct. 4, 1990, 91:4.66
Dwelling, April 22, 1991, 92:4.68
Dwelling, Feb. 28, 1996, 97:5.49
Dwelling, March 10, 1996, 97:5.50
Manufacturing plant, May 16, 1991, 92:4.71
Truck, Nov. 11, 1994, 95:5.67
LP-Gas railroad tank car derailment, March 4, 1996, 96:3.89
Manufacturing plant fire, 1994, 95:2.30
Museum fire, June, 1994, 95:6.98
Office building fire, 1996, 97:2.23
Processing plant fire, 1993, 94:6.36
Public assembly mixed use building fire, 1993, 94:3.29
Railroad rolling stock fires, March 4, 1996, 96:3.89, 97:6.60
Shopping mall fire, 1989, 91:1.29
Warehouse fire, May, 1991, 92:6.75
Warehouse fire, May 3, 1991, 91:6.37

WITZEMAN, LOU

Profile of, 97:5.37

WOBURN, MASS.

Nursing home fire, Oct. 30, 1992, 93:5.49

WOOD AND WOOD PRODUCTS

Aged plywood interior contributes to fire spread, 95:6.107
Fire starts in sawdust, spreads to combustibles, 94:4.30

WOOD FRAMING

Ignited by electric cord, catastrophic fire factor, 92:4.67
Ignited by electrical wiring, catastrophic fire factor, 92:4.68

WOOD SHINGLES, SHAKES

Cigarette, ignited by, in dwelling fire, 96:5.25
Fire spread to shingles under metal siding, 97:6.52
Fire-retardant treatment, effectiveness of, 91:1.24
Fireworks, ignited by, 97:3.30
Fireworks, ignited by, in dwelling fire, 96:4.21
Incendiary fire spread to, 97:6.56
Pile of removed shakes ignited by cigarette, 97:3.30

NFPA Journal
10 Year Index 1987-1997

Produced flaming brands in wildland fire, 92:4.72

Spotlight ignites shingles, 97:1.27

Wildland fire spread factor, 93:6.89

WOOD STOVES

Camping stove fuel used to kindle, ignites fatal fire, 97:6.20

Catastrophic fire caused by, 91:4.64, 68

Gasoline used to kindle, ignited catastrophic fire, 91:4.68

Heat from faulty stove pipe connection of homemade stove, ignites catastrophic fire,
97:5.51

Point of fire origin in area of stove, 98:5.46

Radiant heat from flue ignites stored wood, 92:5.25

Structural framing ignited by, in catastrophic fire, 97:5.49

WOODEN STRUCTURAL MEMBERS

Damage service cable, which ignites joist, 96:5.93

WORLD TRADE CENTER, N. Y., N. Y., EXPLOSION AND FIRE

Catastrophic fire, 94:5.104

Human behavior during evacuation, 95:2.59

Large loss fire, 93:6.91, 94:6.90

WYOMING

Fatal dwelling fire, 1991, 92:5.26

Manufacturing plant fire, 1993, 94:3.30

Sawmill fire, 1990, 92:1.26

Y

YUMA, ARIZ.

Manufacturing plant fire, Nov. 12, 1992, 93:4.33

Z

ZOO FIRES

Pennsylvania, 1995, 96:6.24