Fire Prevention for First Responders and Small Departments

FPSD-Student Manual

1st Edition, 1st Printing-July 2000

Homeland Security

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U.S. DEPARTMENT OF HOMELAND SECURITY

PREPAREDNESS DIRECTORATE

UNITED STATES FIRE ADMINISTRATION

NATIONAL FIRE ACADEMY

FOREWORD

The U.S. Fire Administration (USFA), an important component of the Department of Homeland Security (DHS) Preparedness Directorate, serves the leadership of this Nation as the DHS's fire protection and emergency response expert. The USFA is located at the National Emergency Training Center (NETC) in Emmitsburg, Maryland, and includes the National Fire Academy (NFA), National Fire Data Center (NFDC), National Fire Programs (NFP), and the National Preparedness Network (PREPnet). The USFA also provides oversight and management of the Noble Training Center in Anniston, Alabama. The mission of the USFA is to save lives and reduce economic losses due to fire and related emergencies through training, research, data collection and analysis, public education, and coordination with other Federal agencies and fire protection and emergency service personnel.

The USFA's National Fire Academy offers a diverse course delivery system, combining resident courses, off-campus deliveries in cooperation with State training organizations, weekend instruction, and online courses. The USFA maintains a blended learning approach to its course selections and course development. Resident courses are delivered at both the Emmitsburg campus and its Noble facility. Off-campus courses are delivered in cooperation with State and local fire training organizations to ensure this Nation's firefighters are prepared for the hazards they face.

Course Background and Intent

Fire Prevention for First Responders and Small Departments (FPSD) is ideally suited to the needs of the smallest departments, those in communities serving populations of several hundred to several thousand. This motivational course seeks to create a "passion for prevention" on the part of operationally oriented fire suppression personnel. Never before in the 25-year history of the Federal Fire Programs ahs a course been so developed or specifically aimed at the smallest of departments. With its advocacy theme, it is the course's intent to build support for all aspects of prevention, thus changing the way "small town America" views fire and injury prevention. Following nationwide field testing and accompanying revisions, FPSD will be released to all State fire service training agencies via the NFA's "Train-the-Trainer" Program. Because of its critical importance, both State fire service training agencies and State fire marshals' offices will be invited to select their State's representative to participate in the national release of materials for State use. It is certain to save many lives--perhaps even someone in your own fire department. Please consider encouraging others to participate in upcoming course deliveries as they are scheduled. Thanks for attending!

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COURSE SCHEDULE

Unit 1:	Empowerment to Make Change	3 hours
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Unit 4:	Solutions	3 hours

MODULE 1: EMPOWERMENT TO MAKE CHANGE

TERMINAL OBJECTIVE

At the conclusion of this module, students will be motivated to advocate the importance of fire prevention.

ENABLING OBJECTIVES

The students will:

1. *Identify the devastating injuries that occur from fire.*
2. *Recognize that even the best-equipped and staffed Fire Department can not be in time to stop loss of life or loss of property in many situations.*
3. *Identify the prevention activities that would prevent the loss of life and property.*

THE NATIONAL FIRE PROBLEM

The United States has a severe fire problem, more so than is generally perceived. Nationally, each year, there are millions of fires, thousands of deaths, tens of thousands of injuries, and billions of dollar loss--which makes the U.S. fire problem one of great national importance. i

THE OVERALL FIRE PICTURE

- The U.S. has one of the highest fire death rates in the industrialized world. For 1997, the U.S. fire death rate was 15.2 deaths per million population.
- Between 1993 and 1997, an average of 4,500 Americans lost their lives and another 26,500 were injured annually as the result of fire.
- About 100 firefighters are killed each year in duty-related incidents.
- Each year, fire kills more Americans than all natural disasters combined.
- Fire is the third leading cause of accidental death in the home; at least 80 percent of all fire deaths occur in residences.
- About 2 million fires are reported each year. Many others go unreported, causing additional injuries and property loss.
- Direct property loss due to fires is estimated at $8.5 billion annually. [ii]

RESIDENTIAL PROPERTIES

The residential fire problem represents approximately 80 percent of all fire deaths and 75 percent of the injuries to civilians. It also accounts for more firefighter injuries than any other occupancy category. [iii]

WHERE FIRES OCCUR

- There were 1,795,000 fires in the United States in 1997. Of these:

40% were Outside Fires
31% were Structure Fires
22% were Vehicle Fires
7 % were fires of other types

- Residential fires represent 23 percent of all fires and 74 percent of structure fires.

- Fires in the home most often start in the:

  - Kitchen 29%
  - Bedroom 13%
  - Living Room 7%
  - Chimney 5%
  - Laundry Area 4%

- The South and Northeast share the highest fire death rate per-capita with 17.5 civilian deaths per million populations.

- 84 percent of all fatalities occur in the home. Of those, approximately 80 percent occur in single-family homes and duplexes.

CAUSES OF FIRES AND FIRE DEATHS

- Cooking is the leading cause of home fires in the U.S. Cooking fires often result from unattended cooking and human error, rather than mechanical failure of stoves or ovens.

- Careless smoking is the leading cause of fire deaths. Smoke alarms and smolder-resistant bedding and upholstered furniture are significant fire deterrents.

- Heating is the second leading cause of residential fires and ties with arson as the second leading cause of fire deaths. However, heating fires are a larger problem in single family homes than in apartments. Unlike apartments, the heating systems in single family homes are often not professionally maintained.

- Arson is the third leading cause of residential fires and the second leading cause of residential fire deaths. In commercial properties, arson is the major cause of deaths, injuries and dollar loss.

WHO IS MOST AT RISK

- Senior citizens and children under the age of five have the greatest risk of fire death.
- The fire death risk among seniors is more than double the average population.
- The fire death risk for children under age five is nearly double the risk of the average population.
- Children under the age of 10 accounted for an estimated 18 percent of all fire deaths in 1995.
- Children playing with fire start over 30 percent of the fires that kill young children.
- Men die or are injured in fires twice as often as women.

WHAT SAVES LIVES!

- A working smoke alarm dramatically increases a person's chance of surviving a fire.
- Approximately 90 percent of U.S. homes have at least one smoke alarm. However, these alarms are not always properly maintained and as a result might not work in an emergency. There has been a disturbing increase over the last ten years in the number of fires that occur in homes with non-functioning alarms.
- It is estimated that over 40 percent of residential fires and three-fifths of residential fatalities occur in homes with no smoke alarms. Residential sprinklers have become more cost effective for homes. Currently, few homes are protected by them.[iv]

WHO SUFFERS FROM FIRE

- The Miami Herald, 2-6-97, **Burglar Bars Can Be Fatal,** "While the national fire death rates have been falling steady, fire deaths from people being trapped by burglar bars – as in the deaths of four youngsters in Tampa on Tuesday – is rising…"

- The Miami Herald, 4-29-97, **Fire Kills Two Boys in the Keys,** A house fire killed two young brothers early Monday and left their father in critical condition at a Miami hospital…"

- Detroit Free Press, 4-30-98, **Fire Deaths Show Basement Can be Trap,** "Once the flames approached their basement bedroom, Jacob and Mary Highfiels of Livonia had virtually no chance…"

- Detroit Free Press, 5-7-98, **Month Old Twin Boys Die in Fire,** "Dorothy Musko heard the screams Wednesday morning and figured it was noisy screams waiting for the bus….

- Boston Globe, 1-14-99, **Women Killed in Salem Fire Believed to be Caused by Candle,** "One women died and a man was burned over 80% of his body when a five-alarm fire, believed to have been started from a candle…"

- Boston Globe, 2-17-99, **Elderly Man Dies in Blaze at Home,** "Investigators think a malfunctioning kerosene stove caused a two-alarm fire yesterday that killed an elderly West Bridgewater man destroyed the small remodeled shed he lived in…"

Activity 1.1

Introductions

Purpose

To "break the ice" and allow the students to share real concerns regarding "their" fire department.

Directions

In round robin format each student will introduce him or herself (Name and Department) and answer the question "What do you consider to be the greatest challenge facing your organization."

Activity 1.2

Bear Creek

Purpose

To enable the students to recognize the fact that even the best equipped and staffed fire department can not be in time to stop the loss of life or property in many situations. The student will be able to respond that prevention activities would have prevented the life or property loss.

Directions

1. Read the scenario. The Bear Creek Planning Committee has decided to contract with a professional fire protection consulting group, your group, to scope out questions as well as answers before they go ahead with their plans.

2. Your group has twenty minutes to complete the questions and select a presenter.

3. Present the results of your work.

Small Group Work Sheet

Step One: Select a recorder for your group. Record all answers and recommendations on an easel pad so they can be presented to the full class at the end of the exercise.

Step Two: Review the Bear Creek scenario and related information. (10 mins.)

Step Three: Brainstorm a list of feasibility questions that need answers for presentation to the Bear Creek Planning Committee: (10 mins.)

Step Four: Develop a list of recommendations to answer the feasibility questions above as well as any other recommendations you think the planning committee should know. (25 mins.)

Step Five: Select a group reporter to present your recommendations to the rest of the class when asked by the instructor. (5 minute presentation)

Step Six: The instructor will lead a group discussion on most productive recommendations for presentation to the Bear Creek Planning Committee.

Bear Creek Scenario

Introduction:

Bear Creek is a rural community that has not been organized as a formal municipality. In fact, it lacks a central population center sufficient to warrant such an action. Over the past ten years, the population density has increased from a few scattered homes to over 350 homes in the 75 square miles along Bear Creek.

A county road stretching twenty-five miles along the creek eventually terminates in mountainous timbered land. The Bear Creek area adjoins the West side of a small city, Bakerville, which has a population of 12,000 residents. Their fire department is primarily volunteer with a clerk and full-time fire chief. Bakerville is well established and enjoys an Insurance Services Office (ISO) rating of Class Six throughout the city. Because of its excellent equipment, well-trained volunteers and a desire to help, they have responded to most fires in the Bear Creek area without a formal agreement or reimbursement of costs. Because of long travel distances, they usually end up simply protecting exposures. For this reason, Bear Creek has a Class Ten rating as if they did not have protection.

About a third of the Bear Creek area is timberland, intermingled with homes. The rest is primarily farm and grazing land. The summers are very dry and present considerable risk from wildland fires. The State Department of Forestry has always helped with timber fires in the summer time, but in the winter, they shut down as the risk abates.

While fire loss in the Bear Creek area has always been high in relationship to the population, over the last two years the impact has been severe. Six homes have burned to the ground and two children and one adult lost their lives. People are very concerned about the losses and want to take action to form a fire department with a station at the Bear Creek store and gasoline station. This seems to be a likely spot because the population is more concentrated in that area and the owner is willing to donate the needed land. The Fire Chief from Bakerville has volunteered to help the planning committee gather information and formulate a plan.

Essentially, they plan to form a rural fire protection district as provided by law, assess a one dollar per thousand property tax in the district to fund the department, and build a station on the property donated by the store owner. This will require a vote of the people in the area, but because of the concern over the recent fires, they expect it to pass by a large majority. However, the planning committee is puzzled over a number of questions, primarily whether the scheme will work. The fire chief has not been able to answer the questions. **They have decided to contract with a professional fire protection consulting group, your group, to develop a strategic approach and make recommendations regarding how to proceed.**

Two-Year Historical Fire Incident Data

January 2 years ago — **150 Loop Road**

Loss: $12,500 Residence $75,00 Contents

Scenario: It was a cold winter day and the residents had been using the fireplace to supplement the primary heating system. Throughout the day, the occupants had smelled unusual smoke odors, even after the fireplace was out in the afternoon. That evening they left for an overnight trip. When they returned on the next day, the home was burned to the ground. Because of their isolated location, no one noticed the fire, so only smoldering ashes remained when they returned. However, the county fire investigator was able to detect deeply charred wood on the underside of the fireplace. Old concrete forms were not removed after construction, which resulted in long-term charring and eventually a disastrous fire.

March 2 years ago — **238 Hill View**

Loss: $68,000 Barn $32,000 Hay

Scenario: The farmer always parked a tractor in a lean-to attached to the barn. On this occasion when she entered the lean-to, the fuel line on the tractor ruptured and exploded into flame. The fire spread rapidly and engulfed the whole barn in about ten minutes. She and her husband were able to evacuate all animals, but the structure was totally destroyed.

August 2 years ago — **High Loop Road**

Loss: $30,000 Timber $125,000 Residence

Scenario: Campers just off the end of Bear Creek Road left a campfire burning which eventually escalated to a major wildland fire. The State Department of Forestry responded and did a heroic job of preventing loss to the homes intermingled in the forest area. Only one home was lost.

December last year **Danny Way**

Loss: $75,000 Property Two Children

Scenario: The parents left their two nine and ten year old children home while they attended a grange meeting in the early evening. About 9:30 PM, a neighbor coming home from town noticed flames coming from the manufactured home where the children slept. By the time the neighbor was able to approach the building, it was too hot to rescue the children. The county fire marshal was able to determine the cause of the fire as an electrical malfunction resulting from incorrect use of aluminum wiring.

March last year **Mecca Way**

Loss: $18,200 Property One Burn Victim

Scenario: An older member of the household was cooking breakfast for the family when he inadvertently left a pan on the stove too long. It caught fire. In an effort to suppress the fire, he grabbed the flaming pan and tried to carry it out the back door. In the process, he dropped the pan and spread flaming oil throughout the kitchen. He was able to escape the building but not without severe burns. By the time the Bakerville Fire Department arrived, the building was a total loss.

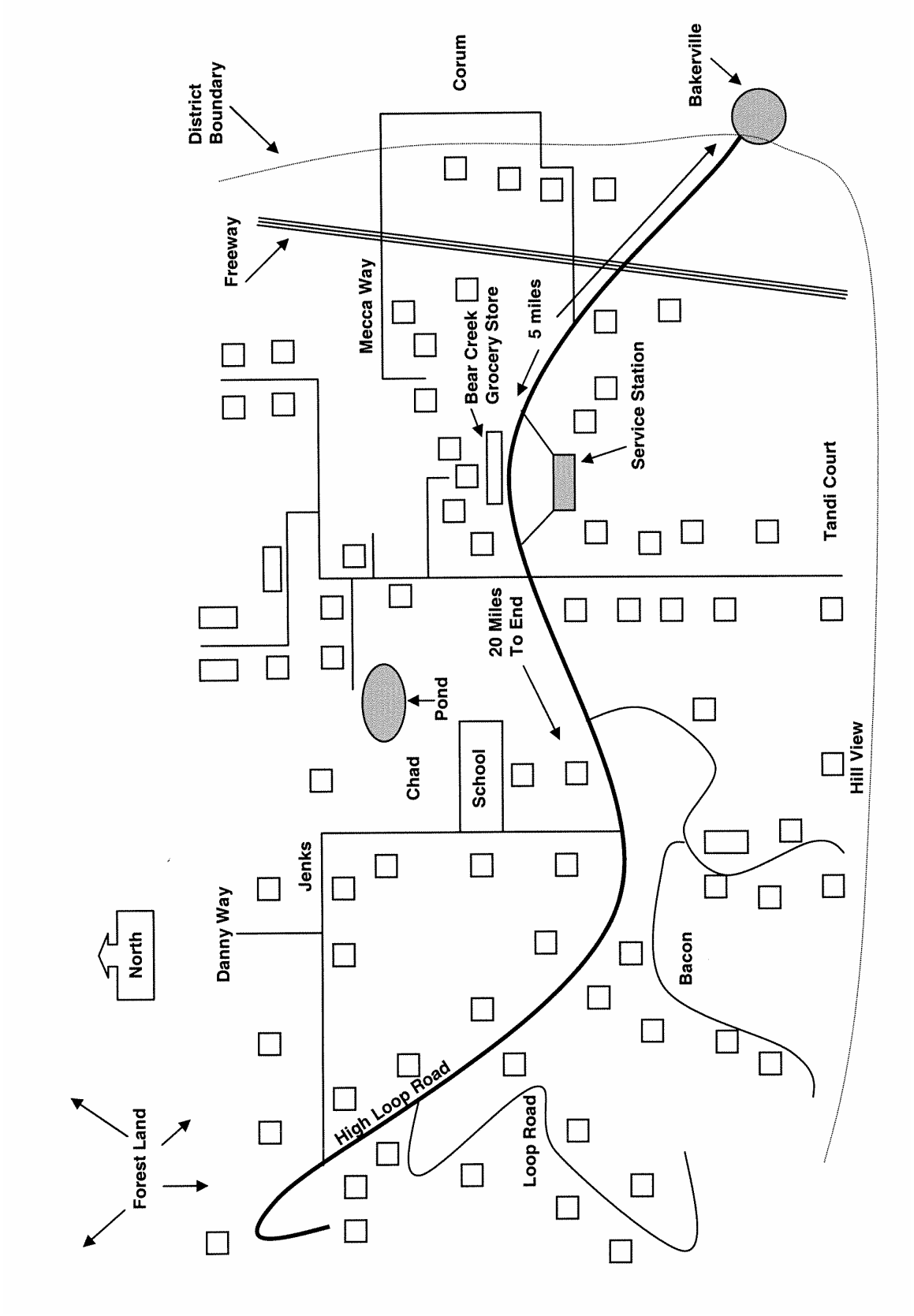
June last year **Tandi Court**

Loss: $67,000 Property One Life Loss

Scenario: A resident of Tandi Court was coming home in the early hours of the morning when she noticed a great deal of smoke coming from her neighbor's mobile home. Upon investigation, it was obvious that the home was fully involved with heat and fire so she could not enter. Using her mobile phone, she called the Bakerville Fire Department. When they arrived, they quickly entered the building to find the older resident dead. Later, the county fire marshal determined the fire to be caused by careless smoking.

Bear Creek Information

- Population: 1,127
- Number of Homes: 362
- Average Home Value: $90,000
- Square Miles: 75 (25 miles long by 3 miles wide+/-)
- Schools: One Elementary
- Fire Protection Rating: Class Ten
- Growth: Industrial and residential growth is the fastest in the county.
- Code Enforcement: The county fire marshal is responsible for regulating new construction but due to recent budget cuts, they do not inspect any buildings. What little support they have to offer is in fire investigation. Rural districts in this state do not have authority to enforce fire and life safety codes. The authority rests with the county with a little help from the state.
- Emergency Medical: A private ambulance company provides BLS and ALS for the entire county, except for that provided by municipalities.
- Fire Incidents: In addition to the six major fires over the past two years, there were approximately 32 additional incidents that emergency response would have helped, i.e., auto accidents, false alarms, assists and trash fires. However, local residents were generally able to satisfactorily cope with each situation.


District Boundary
Corum
Bakerville
Freeway
Mecca Way
Bear Creek Grocery Store
5 miles
Service Station
Tandi Court
20 Miles To End
Pond
Chad
School
Hill View
Jenks
Danny Way
North
Bacon
High Loop Road
Loop Road
Forest Land

Activity 1.3

Self-Assessment

Purpose

To assist you in applying the lessons learned to your own real world situation.

Directions

Is your greatest challenge the same as the one you noted at the beginning of this module?

Have you identified new challenges?

What Have I Learned?

List three things that have changed (outlook or viewpoint) due to this module.

1. _____

2. _____

3. _____

List 5 or 6 new challenges you have identified due to this module.

_____

_____

_____

_____

_____

_____

_____

_____

REFERENCES

[i]http://www.usfa.fema.gov/
[ii]http://ww.usfa.fema.gov/nfdc/overall.htm
[iii]http://www.usfa.fema.gov/nfdc/residential/htm
[iv]http://www.usfa.fema.gov/nfdc/where.htm

MODULE 2: THE FIRE PROBLEM

TERMINAL OBJECTIVE

At the conclusion of this module, students will recognize that fire can be a problem in their communities.

ENABLING OBJECTIVES

The students will:

1. *Review the history of fire in the United States, including "America Burning" and compare the impacts to small community situations.*

2. *Study the Beverly Hills Supper Club Fire to identify the causes, impacts and challenges resulting from this disaster.*

3. *Identify potential fire risks to life, property, community or fire department operations in your jurisdiction.*

4. *Conduct a self-assessment of your ability to gather data and identify risk in your jurisdiction.*

INTRODUCTION

This module strives to give an understanding of how the historical frequency and severity of destructive fires on a state or nation-wide basis relates to your community's risk so you can identify risks and potential impacts in your community.

The details of the Beverly Hills Supper Club fire exemplifies risk to other smaller communities with similar situations. The instructor will present and discuss details of a number of other major loss fires that occurred in smaller communities with similar devastating results. You may recall fires in your jurisdiction that had similar tragic loss of life, property or community vitality.

REVIEW NATIONAL HISTORICAL INFORMATION RELATING TO SMALL COMMUNITIES

The purpose of this discussion is to provide understanding that fire loss remains a serious problem in the United States and that the greatest risk for loss occurs in smaller communities.

The 1947 President's Conference on Fire Prevention identified the following problems:

- Staggering and Rising Fire Waste
- Appalling Life Loss - Estimated 10,000 in 1946
- $561 Million Property Loss (Today's is $9.6 Billion.)

The solutions recommended included:

Education--Public Fire Prevention in schools at all levels including colleges and State and Regional Fire Training Colleges

Engineering--Research and Engineer and Architect Training (Design Community)

Enforcement--Fire Codes and Trained Inspectors

In 1973 "America Burning" identified similar problems:

- Appalling Loss of Life--6,200 Annually.

- $11 Billion Wasted Resources.
- 100,000 Burn Injuries.
- Ignorance and Indifference Toward the Problems of Fire.

Again the recommended solutions included emphasis on Fire Prevention and training as well as accurate and comprehensive fire data.

In 1987, "America Burning" revisited found:

- Life Loss Decreased 23% in 10 Years.
- Firefighter Deaths are Decreasing.
- Children's Clothing Deaths Dropped 90%.

In the Wingspread IV Report (Appendix A, page 71 of USFA publication "Strategies for Marketing Your Fire Department Today and Beyond").

- Every 10 years since 1966, national experts evaluated trends, challenges and offered insights.
- Identifies strategies for both emerging and on-going issues of national importance.

Then again in 1995 the "A Profile of Fire in the United States" (10th edition) summarized losses for '86 to '95 (deaths, injuries, dollars, etc.) from National data and State Profiles.

PROPERTY TYPE	RURAL	U.S.
Outside Fires	45%	43%
Structure Fires	35%	31%
Non-Residential Structures	10%	9%
Residential Structure Fires	25%	22%
Vehicle fires	19%	24%
Other Fires	1%	2%
TOTALS:	100%	100%

Rural Fire Problems:

- 25% of all fires, cause 74% of deaths.
- Rooming, lodging and boarding houses are clearly a problem.

- Property loss relatively constant last ten years
- Loss compared to value at risk is highest in smaller communities.
- 38% of loss occurs in communities under 25,000 population

CASE STUDIES

1989 Mobile Home Fire--Maxton, NC

- Population: Rural
- Fire Department Response: 10 to 12 Minutes
- Life Loss: A Mother and Eight Children
- Contributing Factors: No Smoke Detectors--Kerosene Heater

1989 Rural Home Fire--Remer, MN

- Population: 396
- Fire Department Response: 5 to 7 Minutes After Sheriff's Arrival
- Life Loss: 2 Adults and 8 Children
- Contributing Factors: No Smoke Detectors--Christmas Tree--Housekeeping

1989 Retirement Home Fire--Roanoke County, VA

- Population: Rural/Mixed Residential
- Fire Department Response: 18 Minutes
- Loss of Life: 4 Elderly Residents
- Contributing Factors: Overloaded Electrical--Frigid Temperature

1991 Furniture Refinishing Fire--Brackenridge, PA

- Population: 4,500
- Fire Department Response: 2 to 3 Minutes
- Loss of Life: 4 Firefighters
- Contributing Factor: Floor Collapse

1991 Remote Wilderness Lodge--Grand Marais, MN

- Population: Remote Area
- Fire Department Response: No Fire Department
- Loss of Life: Seven Adults
- Contributing Factors: Failed Detection System--

  Unprotected Exits Stairs

1993 Mercantile Store--Pittston, PA

- Population: 9,500
- Fire Department Response: 2 Minutes
- Loss of Life: Two Firefighters
- Contributing Factors: Faulty Electrical Wiring and Building Collapse

1994 Logan Valley Mall Fire--Altoona, PA

- Population: Mixed Residential
- Fire Department Response: 5 Minutes
- Property Loss: $50 Million
- Contributing Factor: Lack of Fire Sprinkler Protection

Activity 2.1

Risk Identification Exercise

Purpose

To identify targets in your communities that present high potential impacts in terms of risk to life, property, community vitality, and fire department operations.

Directions:

1. Select a recorder.

2. Brainstorm a list of target occupancies in your community (or region) that present potential risk or high impact on life, property, community vitality, and fire department operations. Your group will have 5 to 10 minutes to brainstorm the list and complete the form.

3. Take 10 to 15 minutes to select three target occupancies that create the highest risks and to identify relevant contributing factors.

4. Place the selected high risk occupancies and contributing factors on a flip chart for use in future modules.

5. Select the three highest risk occupancies and identify contributing factors.

Activity 2.1 (cont'd)

Risk Identification Exercise

List Potential Risks:

Activity 2.1 (cont'd)

Risk Identification Exercise

Select the three highest risk occupancies from the preceding page and identify contributing factors: (Risk Factors: Life, Property, Community, Resources).

Risk #1:_____ Occupancy Use:_____

Occupant Load: _____

Contributing Factors:

_____

_____

_____

Risk #2:_____ Occupancy Use:_____

Occupant Load: _____

Contributing Factors:

_____

_____

_____

Risk #3:_____ Occupancy Use:_____

Occupant Load: _____

Contributing Factors:

_____

_____

_____

Activity 2.2

Self-Assessment

Purpose

The purpose of this exercise is to take a few minutes to review how the previous small group exercise impacts your personal risk identification strategies. In less than ten minutes, answer the following questions in relationship to your job or the activities of your department:

Directions

Individually complete the self-evaluation exercise by answering the following questions.

Are you gathering the needed information necessary to identify high-risk occupancies in your community at this time?

_____

_____

_____

If not, how can you collect this information and identify high-risk occupancies?

_____

_____

_____

How do you plan to identify high-risk occupancies in your community?

_____

_____

_____

BIBLIOGRAPHY

America Burning, National Commission on Fire Prevention and Control, United States Fire Administration, 1973

America Burning Revisited, United States Fire Administration, Federal Emergency Management Agency, 1987

A Profile of Fire in the United States, National Fire Data Center, United States Fire Administration, Federal Emergency Management Agency, 1997

The Rural Fire Problem in the United States, United States Fire Administration, Federal Emergency Management Agency, 1998

Fire Investigation Technical Reports, National Fire Data Center, United States Fire Administration, Federal Emergency Management Agency, 1989 to 1994 (Rural House Fire, Remer, MN, January 31, 1989; Mobile Home Fire, Maxton, NC, November 8, 1989; Retirement Home Fire, Roanoke, VA, December 14, 1989; Remote Wilderness Lodge, Grand Marais, MN, July 12, 1991; Four Firefighters Killed, Brackenridge, PA, December 20, 1991; Two Firefighters Killed, Pittston, PA, March 15, 1993; Logan Valley Mall Fire, Altoona, PA, December 16, 1994]

Wingspread IV Report, United States Fire Administration, Federal Emergency Management Agency, 1996

A Profile of Fire in the United States, 1986 to 1995, 10th Edition, United States Fire Administration, Federal Emergency Management Agency, 1996

MODULE 3: EDUCATION, ENGINEERING, AND ENFORCEMENT

TERMINAL OBJECTIVE

At the conclusion of this module, the student will recognize that there are many solutions to addressing the rural fire and injury problem.

ENABLING OBJECTIVES

The students will:

1. *Develop an understanding of the three E's -- education, engineering, and enforcement.*
2. *Review successful programs that exist in target communities.*
3. *Study a complicated enforcement problem that was undertaken by a small fire department.*
4. *Discuss the relevance of pre-fire planning and the role it can play in prevention activities.*

OVERVIEW--PURPOSE OF PREVENTION ACTIVITIES

Many local governing bodies and volunteer agencies (excluding fire departments whose functions include public education) have been involved for years in activities that would reduce fires in their communities.

- Cooperative Extension Services
- Park Services
- Insurance Associations
- Forestry Departments
- Future Farmers of America
- American Red Cross

Each of these agencies has been involved with specific programs targeting fire prevention activities. Communities vary, so in many cases, fire departments have to partner with many nontraditional organizations to access programs that can be implemented in their communities. For example:

- South Carolina--Clemson University Cooperative Extension Service--State-wide School Program

- Virginia--Chesterfield County Fire Bureau--Fire Safety for Vietnamese and Cambodians

- Texas--Beaumont Red Cross--Evacuation of the Elderly and Smoke Detector Program

- Illinois--Park Ridge Fire and Police Departments--Joint Program for Latchkey Children

These are just a few of the programs included in a publication from Tri Data Corporation, Reaching the Hard-to-Reach.

ENGINEERING, EDUCATION, AND ENFORCEMENT

In 1947, President Harry S. Truman called for, hosted, and participated in the "President's Fire Prevention Conference of 1947." The participants in this conference were some of the brightest minds in America at that time. The purpose of this meeting was to identify ways to prevent fires. However, what evolved out of that meeting was the application of a military concept in dealing with safety. That concept was identified as the "3 E's," engineering, education, and enforcement and it applied well to fire safety.

ENGINEERING

One of the recommendations made was that engineering design be incorporated into our nation's engineering and architectural schools. Institutions such as the University of Maryland and Worchester Polytechnic Institute are two of the leading fire protection engineering schools in the country. They focus on curricula such as: fire dynamics, hazard calculations, fire risk analysis, fire modeling, design of detection systems, behavior response, and various other technical courses related to protective systems.

The advances made in fire protection designs and systems have made immeasurable improvement since the recommendations made from the President's Conference in 1947. Graduates from these programs are employed with research facilities, fire protection firms, fire departments, and in the government sector. They have made our buildings and equipment safer through design including: automatic shutoff devices, fireproofing, automatic detection, and quick response sprinkler heads. Each of these have saved lives and property since their inclusion in the codes.

EDUCATION

Another concept that evolved from the President's Conference was education. The purpose of education is ultimately to change behaviors. While historically fire departments have been involved in fire education programs such as Junior Fire Marshal, Smoky Bear, home safety inspections and others, it has only been over the last decade that we have seen the inclusion of full-time public fire educator positions. In addition to full-time positions, the fire service has witnessed the development of professional fire safety programs that can easily be implemented in the community. Probably, the most recognized of these programs is the Learn Not To Burn Curriculum. This program was developed by the National Fire Protection Association with a goal of reducing fire deaths across the country. This was to be accomplished by teaching fire safety to fourth grade students and establishing skills and knowledge they could carry with them throughout their lives.

Another program developed by NFPA and the Lowes Home Safety Council with input from a host of other safety and injury prevention experts is Risk Watch. Risk Watch builds upon the Learn Not To Burn Program but expands to target unintentional injuries. Consequently, fire safety, motor vehicle safety, poisoning prevention, and others are all given equal recognition in the curriculum.

As part of a department's overall fire education program may be the use of a fire safety house. These are either commercially-made or constructed by a local community. They are built to a small scale to accommodate children in an educational setting. Most of these houses are on mobile trailers and have an upstairs bedroom, downstairs living room, and a kitchen. A smoke machine and doors with heating coils simulate real life fire conditions, and the children practice skills that they have learned in order to safely evacuate the house.

Many other programs have been developed and ideas shared by fire departments in their attempt to educate people about fire safety. Some of those programs involve:

- Sparky and Smoky Bear
- Pluggy, the fire hydrant
- Puppet shows with a fire safety theme
- Clown acts
- Rock star impersonators

ENFORCEMENT

Most individuals who are involved in activities related to the fire code will tell you that the most unpopular way of seeking code compliance is through enforcement. They would prefer that people do the right thing and, when given a written notice, correct the violations in a timely manner.

However, there will be those instances when a more stringent means of seeking compliance will be needed. Depending on your state laws and county or city ordinances, code enforcement may be accomplished in various ways.

A. Notices of Violations

In most cases, some type of advanced notice is needed to inform individuals that they may be in violation of the code. Proper documentation and a brief description of the violation, along with an expectation of when the violation would be corrected are all required prior to penalties being assessed.

B. Citations

Often this is the least harsh method of penalty, and the range of monetary assessment can vary widely. In most cases, fees range from $25 to $100.

C. Criminal Penalties

This method is used only for code violations of a serious nature. Usually, the services of a law enforcement official are required. You would need to provide them with as much detail as possible, including code sections and what statutory means that they have to issue such a penalty.

D. Administrative Warrants

Occasionally, an inspector may be refused entry into a building. An administrative warrant is an order issued by a magistrate or through the courts that would legally allow inspectors to gain entry. Procedures need to be established and guidelines spelled out so individual inspectors are able to obtain the warrants in an expedient manner.

E. Permits

Fire departments and other enforcement agencies sometimes issue permits to allow individuals to conduct some type of operation or business that may be extremely hazardous or just be a little more difficult to regulate than an ordinary occupancy. The permit requirements are often given to the applicant with a clear understanding of expectations. Violations can result in the permit being revoked which could close the operation down.

PRE-FIRE PLANNING

Fire departments involved in pre-fire planning activities vary in the amount of detail and time allocated on this function. Some may have computer-aided devices which include to-scale drawings and notebooks full of records and descriptions of the facilities. Others may only do a cursory walk-through when they occasionally get out of the station and only have their memory to recall the details of the so-called pre-fire plans.

Pre-fire planning is a necessary function in which each department should be involved. It helps to be more aware of the occupancy type, life safety issues for the occupants, and potential hazards to firefighters.

Property owners also benefit from this activity. It affords them the necessary information to help them be prepared for any type of fire-related emergency. They become more aware of the hazards that they may be exposed to and, if available, training that the fire department may offer them.

Pre-fire planning is often looked at as a mitigation function. Some in the fire service do not advocate combining pre-fire planning activities with inspections. They believe that the two functions must be separate and distinct. These proponents stress pre-fire planning should include looking for areas where fires may occur and what action the fire department might take to control and extinguish the fire. These same people believe that inspectors are looking for and recording code violations, issuing notices of violations and conducting follow-up inspections to ensure compliance.

What an opportunity the fire service is missing in not combining these services. Pointing out problems, suggesting how to correct them, and providing code-related solutions that could prevent incidents from occurring are examples of customer service programs that could help reduce the incidence of fires in our communities.

Activity 3.1

Pre-Fire Planning

Purpose

To give the participant the opportunity to "walk through" a simulated pre-fire planning exercise.

Directions

Read through the scenario with the instructor. The class will be divided into groups of five participants. Go to assigned breakout areas and work on the exercise. Select a spokesperson and be prepared to present your group's response.

While out in their territory, a fire crew notices a lot of activity at a previously unoccupied warehouse. The officer approaches the new business owner and asks permission to pre-fire plan. When they enter the building, they discover a cardboard and waste rag recycling center. The warehouse dimensions are 150' x 100' with a 24' ceiling height. Cardboard and baled rags are stacked almost to the ceiling. There are narrow aisles, no fire protection system, and a limited water supply.

1. What would you do to work out a solution to this problem?

2. What educational options are here and what educational programs could have helped prevent this?

3. What engineering issues could be used to solve this problem?

4. What enforcement issues are involved here?

Activity 3.2

Self-Assessment

Purpose

To assist the student to reflect on the lessons learned and relate them to their own real world situation.

Directions

List three to four items that you can initiate in your community based on this module. Example: "Forming coalitions is a valuable tool in addressing the fire problem."

_____

_____

_____

_____

_____

_____

In a brief paragraph, describe the most important thing you have learned in this section.

BIBLIOGRAPHY

Ann Kulenkamp, Barbara Lundquist, Philip Schaenman, Reaching the Hard-to-Reach: Techniques from Fire Prevention Programs and Other Disciplines, Tri Data Corporation, Arlington, Virginia, Oct. 1994.

National Fire Protection Association, 1997.
Fire Protection Handbook, 18th Edition
Quincy, MA: Author.

International Fire Service Training Association
Salvage and Overhaul, 7th Edition
Ed Gene Carlson
Stillwater, OK: Oklahoma State University, 1985.

APPENDIX

RURAL FIRE PREVENTION EDUCATION PROGRAM

RURAL FIRE PREVENTION EDUCATION PROGRAM

Chief Clarence Chandler, Retired
Island City, Oregon
May 1999

Background:

In the late 1970's and early 1980's, the United States Fire Administration offered planning and implementation grants to states who were willing to implement the "Five Step Planning Process" for identifying fire problems and developing solutions. The State of Oregon was one of the recipients.

After completing the planning process as a pilot program, the State received implementation funding for use in resolving their problems. The subsequently implemented a statewide system of regional planning groups and "Community Action Mini Grants." Any community that was willing to complete the Five Step Planning Process would be eligible for a mini grant to implement a resolution strategy. Two grants were offered to communities, one for planning and one for implementation. All grants were for less than $5,000.

Island City, Oregon

The Island City Fire Department was a fully volunteer organization serving a very small city of less than 500 residents and about 100 square miles of farms and ranches intermingled among timbered lands- a typical example of the rural/forest interface and all the problems that go with it. During the year preceding their planning effort, the department responded to over 150 fires. Loss was correspondingly high and unacceptable to the members of the fire department. For this reason they applied for and received a planning grant.

Ignorance and Indifference:

During their planning process, they identified fires on farms and ranches in the urban/forest interface as their problem. The causal factors were identified as "ignorance and indifference." People in the area were unconcerned about the number of fires they were causing through poor farm maintenance and careless practices. The plan was to have the volunteer firefighters conduct home, farm and ranch safety surveys to help the citizens gain understanding of the problems and to reduce the number of incidents. However, when the volunteers began to make the surveys, they experienced a strong backlash from the community. It seems they did not trust the firefighters and viewed the home safety surveys as fire inspections and an unacceptable infringement on their independent lifestyle.

Future Farmers of America:

One of the volunteers was a teacher at the local high school and suggested a cooperative program between the fire department, the high school and the Future Farmers of America (FFA). The grant money, which was an insignificant amount, went to the school. The FFA students were taught how to conduct fire safety surveys as a part of their classroom activity. The firefighters helped with the technical information during the instruction.

Once the students were trained, they linked with firefighters and surveyed all homes, farms and ranches in the district. Because they were high school students, they were well accepted by the citizens. After the surveys, community-wide cleanup weekends were scheduled.

Tradesmen were recruited to volunteer their time when more specialized technical advice was needed. As an example, electricians volunteered technical assistance with wiring problems in farm outbuildings. The results were outstanding!

Productive Outcomes:

Fire prevention education became an integral part of the high school curriculum for students who would most likely become future farmers and ranchers in the community. The students had the opportunity to tour many farms and learned about farming and ranching as well. The farmers and ranchers were very receptive and responsive to the surveys conducted by the students. Many of the students became volunteer firefighters when they became old enough. The incident rate in the district was reduced from over 150 fires per year to 72 the following year, when other departments in the area continued to have an increase.

Note: The information contained in this report has not been documented for detail. However, the background and relevant information offered here as recalled from the memories of those who participated, both at the local and state level. Chief Chandler is available to anyone who would like to discuss the experience with him.
Phone 541-963-5855

MODULE 4: SOLUTIONS

TERMINAL OBJECTIVE

At the conclusion of this module, the students will be able to identify resources available to assist their fire departments with solutions to identified prevention problems.

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ENABLING OBJECTIVES

The students will:

1. *Differentiate between prevention activities that take place before the incident occurs and those that deal with reactions to fire and its spread .*

2. *Apply the 3 E's to student-identified prevention challenges by suggesting approaches that will meet those challenges.*

3. *Identify tools and resources that will assist you as you work toward solutions to your prevention challenges.*

4. *Recognize the availability of specific educational tools at various levels that will provide background knowledge and skills needed to meet your prevention challenges.*

PREVENTION

Introduction

Developing an effective prevention program should decrease the severity of fires. A large number of our personnel are suppression oriented by training, experience, and desire and show a negative attitude toward prevention. This attitude is due to lack of knowledge of what prevention is and what value it has to them and the citizens. Personnel may also lack the skills necessary to perform prevention activities. They can derive great personal satisfaction from prevention activities and their organizations can provide better service to their community. This module provides you with tools needed to enhance your prevention efforts.

Two Aspects to Prevention

There are two aspects to prevention: stopping incidents before they begin (prevention) and minimizing the effects of the incident on people and property after the fire has occurred (fire safety). Preventive actions deal with things people do to avoid inception of fire. Fire safety education including education on hazards and causes, fire prevention inspection, code enforcement, fire cause investigation, discouraging arson by thorough investigation and prosecution are examples of preventive actions. Fire safety education is reactive in nature and includes such things as escape planning, residential alarm systems and sprinkler protection, studying how people react in fire situations, and fire department suppression efforts.

Most fire department resources are used to minimize the effects of the incident rather than to stop the incident before it begins. The fire service needs to promote an attitude adjustment in this country. We need to dispel the myth commonly believed by our citizens, "It can't happen to us" by a year-round prevention program. If that charge seems overwhelming, let us make a commitment, start small and build upon our successes.

To illustrate this point, over 500 volunteer and career suppression personnel spent many hours to deal with the Beverly Hills Supper Club fire. Imagine what could have been accomplished if trained and committed personnel had put the same time and effort into prevention activities.

Positive Effects of Prevention Effort

Prevention efforts can have a positive effect on the efficiency and effectiveness of your organization. Benefits include:

- Excellent marketing tool in and of itself.
- Improved public image.
- Improved morale.
- Improved recruitment and retention.
- Improved financial support.
- Decreased life and property loss.

FEASIBILITY OF USING 3 E'S

Some people feel that there are difficulties in using the 3 E's to guide their approach to prevention in their community.

In the area of education, the following difficulties have been identified:

- Lack of knowledge.
- Inadequate planning.
- Failure to delegate.
- Failure to market department and prevention.
- Inability to sense need for and manage change.
- Need to understand how to influence others and how to use power to meet prevention goals.
- Inability to motivate other department members.
- Insufficient time on part of leaders and followers.

In the engineering area, lack of engineering or technical background can provide difficulty. In enforcement, there can be a feeling that involved individuals have no enforcement responsibility or authority in the community. The rest of this module will suggest approaches and resources to overcome these objections.

SOLUTION TOOLS

A skilled leader and manager of prevention activities needs many tools. You should study this list of tools, evaluate your effectiveness in each of the areas, and develop a plan for overcoming your weaknesses. These tools may be used to help you personally be more efficient in what you do

and you may also use them to help others as they work with you on developing your prevention program.

Identification of Key Players or Stakeholders

Stakeholders are those people who have an interest in the outcome of your work. This interest may be positive or negative. It is important for you to identify the prevention stakeholders in your organization and in your community and to predict the nature of their interest. Stakeholders fall into three broad categories. First are those who will actively support your work and they can be recruited with little effort. Second are those people with specialized skills, particular influence in the community, or who have valued perspectives, but whose commitment to your goals is unknown. They need to be courted and encouraged. Finally there are those who may oppose your efforts. It would be easy to ignore them but, given the chance to participate, they can react to your ideas, provide valuable insights, and offer a clear understanding of why they oppose the initiative.

Planning

You should be able to describe a variety of planning experiences, both successful and unsuccessful, and understand why some succeeded and some failed. A simple planning process will enable you to get your work done more efficiently. In its simplest form, the process involves defining your objectives, determining the tasks that must be done to reach the objective, who will do them, by when they need to be completed, and what resources are required.

Marketing

Marketing involves understanding of the needs of your customers and convincing them that you can help them meet their needs.

Benefits of marketing include:

- Enhancing the image of the department and its leadership.
- Improved recruitment and retention through a desire to belong to a well-marketed organization.
- Increased resources because the customers want to provide them for an organization that they admire.
- Reduced risk of liability.

The Change Process

Change involves an understanding of where you are at the present time, where you want to be, and how you will get there.

Workable Prevention Strategies

A workable approach to prevention needs to get and hold people's attention and interest from the beginning and it needs to make sense, provide a clear rationale, and stand up to scrutiny over time. It should also provide a language that is easy to use and that enables people to keep in touch with one another and interpret what is happening to others. The approach should equip people with workable skills that are easily taught and readily usable and it should be results oriented.

Values Supporting Prevention Activity

People can become responsible, within realistic limits, for shaping the conditions under which they live, work, learn, use their leisure and otherwise spend their time. They are their own best resources for bringing about change when it is important to them. Participation promotes ownership in the change being sought and increases commitment to seeing that the change is maintained.

Maintaining Community Support

There are three components to the relationship between prevention efforts and larger community. First there should be an awareness of prevention effort's goals, methods and accomplishments within the community. Second, people must have confidence in the capabilities of those involved. Finally, the community must believe that tangible results can be achieved.

Influencing

Leaders can influence others in the organization through a variety of tactics:

- Leading by example--influencing group members by serving as positive role model.

- Assertiveness--expressing what leader wants done and how leader feels about it.

- Rationality--appealing to logic and reason.

- Exchange--offering to do something for another person if they will do what you want.

- Coalition formation--people arrange to work together to combine their power, and exert influence on another person or group.

- Humor--Good-natured kidding may be accepted better than straightforward criticism.

You should choose the tactic that fits the situation.

Member Empowerment

Members feel empowered when the leader systematically shares power and control with members. When empowered, they experience greater sense of personal effectiveness, motivation, and ownership. A key issue in empowerment is the leader's acceptance of the member as a partner in decisionmaking.

Political Influences

The leader of the prevention effort must understand the importance of the political process and how it works in their community. Interactions with local government leaders, other departments in local government and within the leader's own department affect the ability of the organization to attract resources. Internally conflicts arise between suppression and prevention personnel because suppression doesn't understand nature and importance of prevention and often perceives it as a job threat.

Time Management

Delegation is an effective time management tool. Appropriate delegation can free up time and energy so leaders can use their special expertise in areas where it is needed. If you are committed to prevention, you can find the time for it by delegating other tasks and responsibilities.

You can often get help with prevention activities from non-traditional sources and you can even delegate partial program responsibility to other organizations and volunteers. An advantage of delegating to other organizations is that they can help you with marketing to the benefit of both organizations.

Evaluating Effectiveness

It is critical to evaluate the effectiveness of your prevention efforts. A good effort should be:

- Realistic and goal oriented.
- Practical and specific.
- Designed to attain measurable results.
- Focused upon short and long term impact.
- Cost effective and cost reducing.

Not a luxury, but necessary if a balanced approach to fire safety is to be achieved.

Motivation

The effective prevention leader recognizes the need to motivate those people who are assisting with prevention. Different things motivate different people at any given time and different things motivate the same people and different times. You have to know your people.

PREVENTION RESOURCES

There are numerous resources available to those interested in obtaining information on prevention and fire safety.

The Learning Resource Center at the National Fire Academy has an online catalog of resources, many of which are available on interlibrary loan. You may also call, write or visit their reference service to obtain information. The United States Fire Administration has a catalog listing many outstanding free resources. People in search of information can call the USFA switchboard (301-447-1000) and the operator can direct your call to someone who will be able to assist you. The National Arson Prevention Initiative (NAPI) is one major prevention initiative within USFA and they publish a Prevention Resource Directory.

"Project Impact," a major initiative of the Federal Emergency Management Agency (FEMA) has many aspects of importance to the fire service. Project Impact seeks to change the way the United States deals with natural disasters--events that also have tremendous impact on local fire departments. The goal of Project Impact is to reduce the personal and economic costs of disasters and major emergencies by bringing together community leaders, citizens, and businesses to prepare for and protect themselves from such events. The effort is an investment that will enhance and strengthen the economic structure and long-term stability of communities, regardless of when disasters of any kind strike. Using prevention and mitigation strategies, the Four Phases of Project Impact are Building Community Partnerships, Assessing Risks, Prioritizing Needs, and Building Support and Communicating What You Are Doing. Thus the concepts of Project Impact and the intent of this course are really the same.

Government agency hotlines, private sources such as Aetna, Allstate, McDonalds, the National Safe Kids Coalition, community members with technical or engineering background who are not able to help the department operationally, but might be willing to share their expertise, and Internet searches are other sources of information and assistance.

EDUCATIONAL TOOLS

It is important to know about the educational resources that you have available so that you can develop the background to carry out prevention initiatives in your department.

At the present time there are two other courses planned for this series. The second course will emphasize political influences and how they affect the community's acceptable level of risk, the role of the fire service in the community's overall scheme for risk reduction, and strategies to identify and utilize community and Federal (FEMA.) resources. The third course will describe various internal and external individuals and organizations and how they can form effective alliances to implement a community risk mitigation program. Planned topics include leadership, marketing, selling, mitigation, managing staff, and coalition building

The National Fire Academy offers resident, regional, and direct delivery programs of varying length to accommodate the needs and interests of those working in the prevention area.

- Fire prevention management curriculum.

- Fire prevention technical curriculum.
- Fire prevention public education curriculum.
- Arson mitigation curriculum.
- Emergency response to terrorism curriculum.
- Hazardous materials curriculum.

Interested students should contact the NFA Admissions Office (301-447-1000) for further information and to request a catalog.

The National Fire Academy, through its "Degrees at a Distance" program offers the following programs:

- The Community and Fire Threat.
- Applications of Fire Research.
- Incendiary Fire Analysis and Investigation.
- Fire Protection Structures and Systems Design.
- Fire-Related Human Behavior.
- Fire Prevention Organization and Management.

Contact the NFA Program Office--Degrees at a Distance Program for further information.

Networking opportunities abound. You might want to seek assistance from members of community with specific skills or knowledge, insurance industry resources, prevention personnel in other communities, county and state government resources, and county and state fire service organizations.

UNIT SUMMARY

There is a difference between prevention activities that take place before the incident occurs and those that deal with reactions to fire and its spread. Education, engineering and enforcement give us a basis by which we can determine appropriate interventions when dealing with our fire challenges. We must identify and acquire tools and resources that are available to us as we work toward solutions to these challenges. There are many educational tools at various levels that will provide background knowledge and skills needed so that we can meet our prevention challenges.

COURSE SUMMARY

What better way to close than to recall the words of Vina Drennan:

"Share my indignation. Together we can make a difference. Stop calling fires accidents. These terrible tragedies will be prevented when we find the will to change. With open eyes, we can create a climate that demands more responsible behavior with regard to fire safety.

"…If we develop the will, good sense and responsible behavior will prevail. Together we can make a change."

Activity 4.1

Applying the 3 E's

Purpose

The student will apply the 3 E's to student-identified prevention challenges by suggesting approaches that will meet those challenges.

Directions

1. Select one of the high impact targets in your community as identified in the Module 2 Small Group Activity: Risk Identification.

2. Decide how the 3 E's would apply when planning a prevention intervention for this target and discuss specific reasons for their choice(s). You should consider each of the 3 E's in your discussion. Allow 20 minutes for this part.

3. You should select one member to present a 2 minute summary to the class of what the group learned or something interesting you discussed.

Activity 4.2

Personalizing the Course

Purpose:

The student will apply the knowledge and skills developed in the course to a prevention challenge that exists in his/her own department and develop a tentative action plan for dealing with that challenge.

Directions:

Identify a fire problem that exists in your community. If you have limited experience in prevention, you might want to select a less complex challenge. If you are more experienced, you may want to select a greater challenge. It may either be a specific type of hazard or a specific group of people. Complete the questions below as they apply to the problem that you chose.

1. State the prevention problem that you have selected.

2. Which of the 3 E's are applicable to your problem? Why?

3. What is the objective you hope to achieve?

Complete the Action Plan

	Task	Who's responsible?	By when?	Needed resources?
1.				
2.				
3.				
4.				
5.				
6.				
7.				

5. What new skills do you need to develop to complete the project?

6. How are you going to find the time to work on the project?

7. How are you going to market the project to your department and its members?

BIBLIOGRAPHY

Lofquist, William A., Discovering the Meaning of Prevention - A Practical Approach to Positive Change, AYD Publications, Tucson, AZ, 1983.

Huppe, Frank F., Successful Delegation, Career Press, Hawthorne, NJ, 1994.

McLeish, Barry J., Successful Marketing Strategies for Nonprofit Organizations, John Wiley & Sons, Inc., New York, 1995.

Morrison, Emily Kittle, Working with Volunteers-Skills for Leadership, Fisher Books, Tucson, AZ, 1988.

Price Waterhouse Change Integration Team, Better Change: Best Practices for Transforming Your Organization, Irwin Professional Publishing, Chicago, 1995.

Robertson, James C., Introduction to Fire Prevention, (fourth edition), Brady/Prentice Hall, Upper Saddle River, NJ, 1995.

Smith, Bucklin & Associates, The Complete Guide to Nonprofit Management, John Wiley & Sons, Inc., New York, 1994.

United States Fire Administration, Strategies for Marketing Your Fire Department Today and Beyond, Federal Emergency Management Agency, (FA 182), Washington, DC, 1998.

Wolf, Thomas, Managing a Nonprofit Organization, Simon and Schuster, New York, 1990.

Appendix A
America Burning

The full referenced items and many more are available from the United States Fire Administration (USFA) via the Web page (see Unit 4 for ways to contact USFA). New and revised publications are issued monthly.

AMERICA BURNING

The Report of The National Commission on Fire Prevention and Control

The Commission on Fire Prevention and Control has made a good beginning, but it cannot do our work for us. Only people can prevent fires. We must become constantly alert to the threat of fires to ourselves, our children, and our homes. Fire is almost always the result of human carelessness. Each one of us must become aware—not for a single time, but for all the year—of what he or she can do to prevent fires.

—President Richard M. Nixon
September 7, 1972

WHAT THIS REPORT IS ABOUT

The striking aspect of the Nation's fire problem is the indifference with which Americans confront the subject. Destructive fire takes a huge toll in lives, injuries, and property losses, yet there is no need to accept those losses with resignation. There are many measures--often very simple precautions-that can be taken to reduce those losses significantly.

The Commission worked in a field where statistics are meager, but its estimates of fire's annual toll are reliable: 12,000 American lives, and more than $11 billion in wasted resources. Annual costs of fire rank between crime and product safety in magnitude. These statistics are impressive in their size, though perhaps not scary enough to jar the average American from his confidence that "It will never happen to me." In a Washington hearing the Commission heard testimony from the parents of a J-year-old boy who caught fire after playing with matches. They described the horror of the accident, the anxiety while awaiting doctors' reports, the long weeks of separation during the critical phases of treatment, the child's agony during painful treatment, the remaining scars, and the many operations that lie ahead. Multiply that experience by the 300,000 Americans who are injured by fire every year, and consider, as we did, that it could easily happen in your own family; then the Nation's fire problem becomes very immediate and very fearsome.

During its deliberations the. Commission uncovered many aspects of the Nation's fire problem that have not received enough attention-often through indifference, often through 'lack of resources. It became clear that a deeper Federal involvement was needed to help repair the omissions and help overcome the indifference of Americans to fire safety.

We felt strongly that fire prevention and control should remain primarily local responsibilities. Local governments-through codes and fire safety laws, and through heavy investments in fire department personnel and equipment-have shouldered the major burden of protecting citizens from fire and should continue to do so. Those governments appreciate special local conditions and needs more fully than an arm of the Federal Government would be able to do. Roles for the Federal Government, in the Commission's view, are appropriately limited to lending technical and educational assistance to State and local governments, collecting and analyzing fire information, regulating the flammability of materials, conducting research and development in certain areas, and providing financial assistance when adequate fire protection lies beyond a community's means.

To the extent these functions are being performed at all, they are scattered among the Federal agencies. The Commission feels there should be an entity in the Federal Government where the Nation's fire problem is viewed in its entirety, and which encourages attention to aspects of the problem that have been neglected. This same entity would serve as the conduit for the inter-governmental cooperation that is needed to combat the Nation's fire problem. Accordingly, the Commission recommends the establishment of a United States Fire Administration in the Department of Housing and Urban Development where the primary Federal responsibility exists with local government. The US. Fire Administration would not swallow all the ongoing programs of research and action, but would supplement them for the sake of a more coherent effort to reduce the Nation's fire losses. In this way, the special abilities of each Federal agency would be utilized.

The following summarizes briefly some of the aspects of the Nation's fire problem which the Commission studied and which the U.S. Fire Administration, through encouragement or direct sponsorship, could help to solve :

- *There needs to be more emphasis on fire prevention.* Fire departments, many of which confine their roles to putting out fires and rescuing its victims, need to expend more effort to educate children on fire safety, to educate adults through residential inspections, to enforce fire prevention codes, and to see that fire safety is designed into buildings. Such efforts need to be continuously evaluated, so that the Nation can learn what kinds of measures arc most effective in reducing the incidence and destructiveness of fire.
- *The fire services need better training and education.* Training for firefighters and officers ranges from excellent, as in some large cities, to almost non-existent, as in many rural areas. Better training would improve the effectiveness of fire departments and reduce firefighter injuries. Better education provides the key to developing leadership for fire prevention.
- *Americans must be educated about fire safety.* Most destructive fires are caused by the careless actions of people, largely through lack of concern and ignorance of hazards, Many fires caused by faulty equipment rather than carelessness could

be prevented if people were trained to spot the faults before it's too late. And many injuries and deaths could be prevented if people knew how to react to a fire, whatever its cause.

- *In both design and materials, the environment in which Americans live and work presents unnecessary hazards.* The hazards of flames have been studied and regulated to some extent, but recognition of the hazards of smoke and toxic gases has come belatedly. Ironically, efforts to make materials fire-retardant may have increased the life hazard, since the incomplete combustion of these materials often results in heavy smoke and toxic gases. While materials and products that present unreasonable hazards should be banned, the Commission believes the major emphasis should be on a labeling system (to be developed by the Consumer Product Safety Commission) for materials and products, so that consumers, at the time of purchase, know what risks are involved. The impact of new materials, systems, and buildings on users and the community should be assessed during design stages, well before use. Careful analysis and filing of a fire safety effectiveness statement should permit recognition of faults before tragedy strikes.
- *The fire protection features of buildings need to be improved.* There is a need for automatic fire extinguishing systems in every high-rise building and every low-rise building in which many people congregate. Economic incentives for built-in protection are not available today and should be provided. Many communities are without adequate building and fire prevention codes, and many nursing homes and other facilities for handicapped citizens are without adequate fire protection. Perhaps most important, Americans need to be encouraged to install early-warning fire detectors in their homes where most fire deaths occur.
- *Important areas of research are being neglected.* The state-of-the-art in firefighting, in treatment of burn and smoke victims, in protecting the built environment from combustion hazards, points to the need for a major expansion of research and development in these areas. Progress in most of these areas is hindered by a lack of fundamental understanding of the behavior of fire and its combustion products.

To encourage solutions to these problems, the Commission has made recommendations in this report to a number of bodies: the American public, the President, Congress, State and local governments, industries, professional organizations, and agencies of the Federal Government. It has also outlined important tasks for the proposed US. Fire Administration:

- to develop a comprehensive national fire data system, which will help establish priorities for research and action ;
- to monitor fire research in both the governmental and private sectors, to assist the interchange of information, and to encourage research in areas that have been neglected;
- to provide bloc grants to States so that local governments may develop comprehensive fire-protection plans, improve firefighting equipment, and upgrade education of fire service personnel:
- to establish a National Fire Academy for the advanced education of fire service officers and for assistance to State and local training programs;
- to undertake a major effort to educate Americans in fire safety.

The Commission has also recommended the reinforcement of programs in other agencies, including: detection and alarm systems for federally assisted and insured housing, and built-in protection loan insurance (Department of Housing and Urban Development) ; extension of burn treatment facilities (Department of Health, Education, and Welfare) ; burn and smoke research (National Institutes of Health) ; rural fire protection (Department of Agriculture) ; and further research in the engineering-based technology programs of the National Bureau of Standards.

If these efforts are carried out we predict a 5 percent reduction in fire losses annually until the Nation's losses have been halved in about 14 years. A 5 percent reduction in resource losses alone would amount to $350 million in the very first full year, which is considerably more than the annual costs of the projected Federal involvement of $153 million annually, as discussed in Chapter 19.

The public members of the Fire Commission represent the Nation's firefighters, insurers, fire equipment manufacturers, testing laboratories, and other groups in the private sector concerned with reducing the Nation's fire losses. We reached the conclusion that there must be a significant Federal effort only after careful consideration of the shortcomings of present efforts to reduce fire losses in the United States.

Many of the Commissioners have devoted their careers to improving the Nation's fire record. We have become accustomed to public indifference to the fire problem. But we hold the hope that this attitude can be changed. It is our wish that this report will provide a turning point, by reaching-if only indirectly-the conscience of millions of Americans.

MINORITY REPORT

Minority Report of Anne Wight Phillips, M.D., Harvard Medical School, Massachusetts General and Youville Hospitals.

TO KEEP THEM SAFE

A Tribute.-This minority of the National Commission on Fire Prevention and Control commends the President and the Congress for their concern for public safety and wishes to express her esteem for the dedicated majority of the Commission with some of whose recommendations she concurs although taking the liberty of disagreeing with others.

FIGURE 1

I am indebted to Patty and her parents for permission to present this series of pictures, which emphasize, more adequately than words can tell, the urgency of our fire problem. This picture was taken at age 8, before her burn injury.

Top photo by Frank Kelly, Boston Herald American

MINORITY REPORT OF COMMISSIONER ANNE W. PHILIPS, M.D.

Mr. President and Members of the Congress of the United States:

This minority, although endorsing many of the conclusions and recommendations of the majority of the Commission, cannot approve the following :

I, The magnitude of the projected budget for the majority's program ($153,090,000)

II. The location of responsibility for all of the nation's fire problems within a single agency and department

III. The proposed paramount objective for the new U.S. Fire Administration and the resulting distribution of resources recommended

IV. The proposed interim budget for the National Bureau of Standards

I. The Minority Opposes the Projected Budget

The saving of a single life is not justified, if for the same expenditure of funds and effort, it is **pos**sible to save more than one. Neither in direction nor magnitude can I support the majority's projected budget, for I believe that the saving in lives, property, and human suffering, which would be achieved by the Commission majority's program, can be equalled or exceeded with a significantly smaller budget.

II. The Minority Opposes the U.S. Fire Administration

At the end of the first half year as a member of the Commission I was in favor of the creation of a single Federal agency to coordinate the activities of all agencies concerned with fire in the Federal *Gov*ernment. The need for careful planning for the Nation's *fire* programs and the prospect of economy through reduced duplication and administrative overhead seemed to justify it. Reluctantly, I have come to take the opposite position for the following reasons :

1. Likelihood of neglect of *important aspects of the fire problem*

In whatever department the proposed U.S. Fire Administration settles, it must, inevitably, (unless it is very large) lack expert knowledge and special interest in those fire problems, which are primarily concerned with the interests of other Federal departments. Even with the best of intentions, needed programs outside the major thrust of the Administration and the interests of the chosen department will be down-graded or neglected, receiving less attention and funding than they merit-in part because the department and the administration will

not have the background to see their importance and in part because the outside department will have less interest in pursuing fire programs, considering them Fire Administration matters.

Judging from the proposed budget, this downgrading process has already begun.

2. Limited national resources

At its first meeting, the National Commission on Fire Prevention and Control unanimously adopted as its objective the reduction of the losses of life and property from destructive fires. A glance at the majority's proposed budget will indicate that any prospects of financial savings, due to better administration or wasteful duplication, may be of fleeting benefit in the face of the high costs of the proposed programs, some of which may have little impact on the losses of life and property from destructive fires. In view of our limited resources it appears wise to spend such funds as can be made available on solutions to the fire problem, using existing agencies, rather than on creating a new administration and new demands for funds.

3. Existing agencies could make substantial *strides in fire prevention and control*

It is sound policy to give responsibility for any enterprise to those with special knowledge and ability in the field, but impossible in this case, since no single department has "expertise" in all aspects of the fire problem. There are many people with such specialized knowledge and ability in the various Federal departments and in the private sector, who are ready, willing, and able to go to work on reducing the Nation's fire losses. It seems the part of wisdom to use them.

4. Loss of *valuable volunteer effort*

It is apparent from the programs proposed for the U.S. Fire Administration that, if implemented as written, the Administration would take over many functions which are now carried out-without cost to the taxpayer-by private enterprise. This minority cannot contemplate with complacency the demise of the National Fire Protection Association, for example, which in the 78 years of its existence, has, through its fire prevention efforts, its educational programs and its life safety codes, become a world leader in the continuing war against fire. No one will ever know the number of lives, jobs, and millions of dollars worth of property saved by their endeavors.

If a U.S. Fire Administration is to be, let the enabling legislation be so drawn that maximum use is made of such private agencies. It would seem simpler and cheaper and quicker to call upon them for their expert assistance now, without the creation of a new Government agency.

5. White knight effect

The fire problem has wide ramifications-social, political, scientific, economic, and so on. The proposed multifaceted US. Fire Administration, by taking on all aspects of the fire problem, may, like the white knight, gallop off in all directions, spreading itself too thin to prove the master of any. It would seem that there is more to be gained by tackling smaller aspects of the problem and handling that little well.

6. *The* Commission recommendations run *roughshod over Title I*

Congress, by Title I of the Fire Research and Safety Act of 1968 (see App. I), authorized the Secretary of Commerce to conduct, directly, or through grants, fire research, educational programs, a fire information reference service, and so on. In that act Congress also assured the continuation of other existing Federal fire programs by stating that "nothing contained in this title shall be deemed to repeal, supersede, or diminish existing authority or responsibility of any agency or instrumentality of the Federal Government." Congress, therefore, after due deliberation, felt it unwise to remove all fire problems to a single department, although giving the Department of Commerce the lion's share of the responsibility. This Commission minority finds itself in agreement with them.

FIGURE 2

Patty's face on her first admission to the Shriners' Burns Institute in Galveston. She underwent more than 3 months of reconstructive surgery, costing approximately $27.000. (The darkening of her hair at this age is normal for her family coloring). Figure 3 shows her appearance after many operations.

7. Inevitable delay

Statistics tell us that 300,000 children are going to be seriously burned in this country in the next 2 years. Their suffering depends upon our speed (Figs. 1, 2, and 3). Admittedly, we are never going to prevent all fire accidents, but there is sound evidence that many of the victims can be spared if fire safety education programs are promptly initiated. With swift and adequate funding, the Department of Commerce might have the multimedia education campaign recommended by the Commission well underway before hearings on the proposed U.S. Fire Administration can begin.

8. Danger *of* pressure from special groups

Although in the majority of instances the interests of special groups in the fire field will run parallel with the interests of the Nation, the situation should not be created where the Nation's fire interests could be subordinated to those of any special group.

III-A. The Minority Questions the Direction of Emphasis for the U.S. Fire Administration

This Commissioner believes that, if there is to be an all-encompassing U.S. Fire Administration, its paramount objective should be the same as that adopted by the Commission: *the reduction of the losses of life and property from destructive fires.* Contributing to that objective should be programs such as firesafety education for the general public, applied research to produce a safer environment, basic research on the nature of fire and smoke, their behavior and control, improved education for members of the fire service, and so on,

FIGURE 3.

Results after extensive plastic reconstruction. Patty wishes no further surgery at this time.

The concept set forth in Chapter 19, that assistance to local fire services should be paramount among the objectives of the proposed US. Fire Administration I cannot accept.

Tremendous credit should be given to the fire service for its ready acceptance of the concept that firemen should serve primarily as "fire preventers", rather than "firefighters." They will need help in changing to this new position. Even before this shift, there was a need for better education of the fire officer-better training in command, management, educational and training techniques, fire suppression, community relations, arson, and so on, to which the new emphasis on fire prevention must be added.

I believe that creation of a National Fire Academy is needed, but not as an objective ranking higher than all others. If a secondary objective is to be assigned, let it be to knowledge-new knowledge through research and dissemination of existing knowledge. *Widespread public education in fire safety principles should be our first concern.*

There is an old saying in the fire service, cited in the Commission report, that "The three principal causes of fire are men, women, and children." Statistics bear this out, making it crystal clear that most deaths, most injuries, and most fires are caused by people. Since people are the cause of the overwhelming majority of fires, it is reasonable to believe that people must be included in the solution.

Much can be done by making clothing fire resistant and by installing automatic extinguishing systems and early detection systems-there have been no recorded instances of multiple deaths in buildings fully equipped with operational sprinklers, for example-but man can, and does, circumvent the devices installed for his protection, painting over sprinkler heads, propping open smoke and fire doors and putting a penny in the fuse box. There is no substitute for understanding how to prevent fires and what to do when fires occur.

What do Americans Know About Fire Safety?

In the first months of the Commission's existence, a search was made for data on the American pub. lic's knowledge of fire safety principles, Surprisingly, the only studies discovered were made after small fire education campaigns. No one had probed our citizens' basic fire knowledge.

Since an incredible delay is necessitated by Federal restrictions on questionnaires, a survey of our citizens' knowledge was undertaken independently of the Commission and without its financial sup-

port.' Initially several hundred adults and children around the Nation were interviewed. Then a questionnaire was devised and is now being used in schools, together with an answer sheet, so that students can learn, while correcting their own papers. A copy of the questions will be found in Figure 4, should the reader wish to sample his or her own firesafety knowledge before reading further, The answers appear at the end of this minority report.

Figure 4

FIRE SAFETY QUESTIONNAIRE

Student ☐ Fire Safety Teacher ☐ Age ——
Schooling: Public ☐
Private ☐
Teacher ☐ Previous Fire Training, ——————
Where (if any) school, Scouts, Army, industry, etc.
Address: —————— Sex: Male ☐ Female ☐
City State

1. If your house began to fill up with thick, black smoke, what would you do? (answer fully)
2. What would you do if you woke up at night, smelled, smoke, and found that your bedroom door was shut, but hot when you touched it?
3. Will the clothing you have on now burn?
4. What would you do right now if your clothing caught on fire?
5. If you were trapped in a bedroom on the fifth floor with flames outside in the hall and smoke pouring in under the door (with no telephone and no fire escape), what would you do?
6. (a) When you go to a strange place (movie house, friend's house for the night, hotel, restaurant, etc.), do you check to see where the exits or fire escapes are?
   (b) If the answer to 6(a) was "Yes," do you depend on being able to see the exit to find it, or do you figure out how to find it in the dark or in thick smoke?
7. Do you have a family escape plan, including ways of getting out of your house if the stairs or doors are blocked by fire, *and a meeting place* outside the house?
8. What should you do (or should your wife or mother do) if the frying pan catches on fire?
9. Carbon monoxide is produced by almost all fires. What effect does it have on you before it makes you sleepy and kills you?
10. Assume you plan to hang by your hands from a window ledge and then drop to the earth below. Estimate in feet the distance you could drop and still have a 50:50 chance of surviving without serious injury.
11. (a) What is the reason for having fuses in an electric circuit?
    (b) What strength fuse should be used in an ordinary lighting circuit?
12. What number should you dial to report a fire by telephone, and how should you report it?
13. When is an electric cord dangerous? (give at least two examples)
14. When is a double plug dangerous?
15. What should you do if you discover a large fire in your basement?
16. If you are trying to light a gas oven or burner and the first match goes out too soon, what should you do?
17. What is meant by "spontaneous combustion" or "spontaneous ignition"?
18. How should you store oily or greasy rags?
19. Why should gasoline be stored only in metal cans with self-closing caps?
20. Should you put out an electric fire with water?

Limited Survey Finds Alarming Voids in Public Fire Safety Knowledge

Data from 2,109 Americans of all ages from Maine to Florida and New York to California follows. [2] It would be presumptuous to generalize from this small sampling to the Nation as a whole, but thus far the findings have been surprisingly consistent from State to State and from one school district to another.

Less than 30, out of every 100 teenagers questioned, knew that in the presence of smoke they should stoop low or crawl out of the fire area.

Half of the youngsters from 7 to 18 questioned would do something dangerous if the frying pan caught fire, attempting to carry it or throw water on it. Teenagers were no more knowledgeable than children from 7 through 12.

Over 500 people questioned did not know that opening a hot door during a fire would almost certainly expose them to heat above human tolerance. This group included 44 out of 177 teachers.

Almost no children under seven knew that they should drop and roll if their clothing caught fire.

Very few families had a well thought out escape plan, including a predesignated meeting place outside the house.

Three-quarters of the adults questioned recommended the use of too strong a fuse for an ordinary lighting circuit.

Asked what they would do if trapped in a fifth floor room with flames outside in the hall and smoke pouring in under the door (with no telephone and no fire escape), only 3 out of 10, old or young, thought to stuff anything into the death-dealing crack. Some, of all ages, including teachers, said they would jump.

39, out of every 100 adults questioned, would react dangerously if their clothing ignited, many failing to comprehend the speed with which fire can spread to the neck and shoulders from the trouser cuff or hemline (Fig. 5) .

[1] This Commissioner has paid for all printing and most of the postage from her own limited resources. She is indebted to Harvard Medical School for a small supplementary outlay for postage.

[2] The author of this report wishes to express profound gratitude for assistance in this survey rendered by Chief Robert Fly of Kirkland, Wash., and Chief Merrill Hendricks of Dallas, Tex.

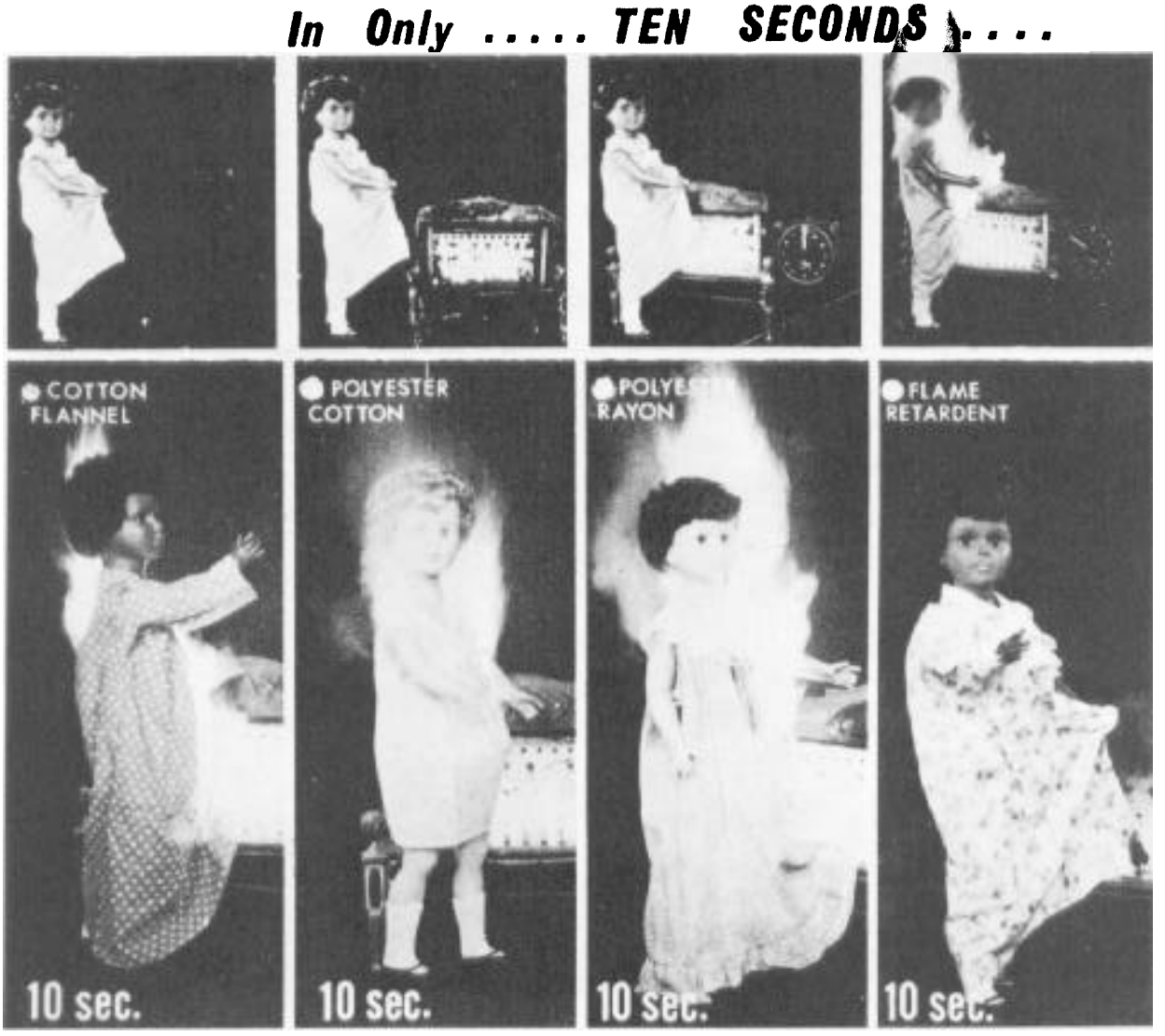


FIGURE 5

The need for public fire safety education is clear. That it can be effective is documented by the Commission in Chapter 15. Other evidence is available. Hopefully, my objection to the direction proposed for the U.S. Fire Administration now appears justified.

What of the budget?

III-B. The Minority Opposes the Budget Allocations

My main objections to the proposed budget are threefold :

1. Proposed budget is not responsive to the concerns of the Nation's fire chiefs.-In the early days of this Commission, a questionnaire was sent out to fire chiefs throughout the Nation. Replies from 10,000 chiefs have been tabulated, Under the heading "Evaluation of Fire Department Problems" the chiefs were asked to rank "in order from most serious to least serious" the problem areas of concern to them. Unselfishly, the chiefs gave top ranking to "lack of effective public education on fire safety." Inadequate training and education for fire service personnel was listed eighth and the need for improved fire department apparatus and personnel protective equipment ninth. The proposed budget fails to reflect their considered opinions.

2. Need for pilot projects.-The majority of the Commission has recommended that every local fire jurisdiction prepare a master plan designed to meet the community's present and future needs, and $30 million are budgeted for local master plan development. Similarly $15 million have been set aside for equipment upgrading and $10 million for detection and alarm systems and built-in protection loan insurance, We do not know whether these programs will reduce the losses of life and property from destructive property. These, and untried educational programs, should be tested on a local or regional basis through pilot projects, before investing large amounts of money on their implementation nationwide. Training of burn specialists should likewise, precede the development of burn centers.

3. Inadequate provisions for public education.-The budget allotment for public education will not produce the type of program the Commisison has envisioned in chapter 15. There are 25 million children in this Nation between kindergarten and sixth grade. The $6 million specified for elementary school education on chart 15.2 is estimated by both private and Government experts to be insufficient to put one piece of effective material in the hands **of** each school child. Ten million would be required to supply effective graded materials to each of the Nation's 1.3 million elementary school teachers. Other means, such as using existing films and visual aids, close-circuit TV, etc. should be explored, but it seems unlikely that the proposed budget will be adequate to achieve the desired results.

IV. Minority Finds Interim Budget Insufficient

The setting of the interim budget at $3 million **for** research and engineering programs fairly well precludes the National Bureau of Standards from acting in accordance with most of its mandate under Title I during the next year or two. Assigned an inadequate budget of $5 million at the outset and underfunded at that, it can be reasonably expected to continue to do only those things for which it has the greatest research and engineering ability. The NIFE program (National Inventory of Fire Experience) for cooperative effort between the Bureau of Standards and the National Fire Protection Association will probably be left in abeyance because of the uncertainty of its future. If a national fire data system is to be set up under the US. Fire Administration, and essentially independent of them both, there may be little initiative to go forward.

Almost certainly 2 years and more will pass before any real Federal fire safety education program is undertaken (whether through grants or otherwise), while week after week more Pattys are carried into the Nation's hospitals (Figs. 2 & 3).

DISCUSSION

I. Budget

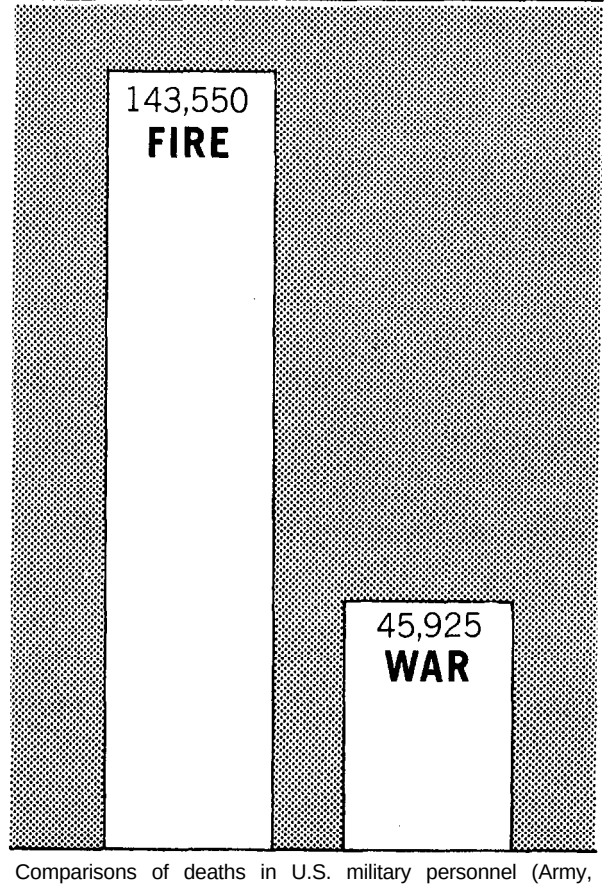
Although in my opinion the total budget proposed by the majority of the Commission is too big, yet what has been spent on fire prevention and control by the Federal Government in the past is too small.

II. Measures To Reduce Injuries and Loss of Life and Property From Destructive Fires

It is the conviction of this minority that *without* ***a continuing massive program to educate the public in simple fire safety measures, a substantial reduction*** *in* ***our tragic American fire toll cannot be expected.*** The principal measures recommended to save lives, suffering and property are:

1. A massive multimedia, recipient-oriented public education campaign.
2. Fire education in the schools.

FIGURE 6 Deaths – U.S. Fires vs. Vietnam War



Comparisons of deaths in U.S. military personnel (Army, Navy, Coast Guard, Marine Corps, and Air Force) resulting from actions by hostile forces in Vietnam, 1961 through 1972, and deaths from U.S. fires for the same period (Statistics from the Department of Defense and the National Fire Protection Association).

3. Fire department involvement in fire safety education of commercial, industrial, and institutional personnel and in an optional inspection program for dwellings.

4. Development of a reliable and inexpensive smoke and fire detection system for dwellings.

5. Reduction of the hazards of flammable wearing apparel.

6. Use of noncombustible interior finish materials in residences and places of business and assembly.

7. Complete automatic fire extinguishing systems for homes (and hospitals) for the incapacitated and for high-rise buildings.

8. A program of fire safety training for the health educator aides of the Department of Health, Education, and Welfare, who, because of their rapport with the residents of high-risk areas may be able to teach fire safety principles on a person to person basis.

9. Increased research on smoke and smoke inhalation injury which is responsible for more than half of the Nation's fire deaths.

III, Principal Measures To Improve the Fire Services

1. Establishment of a National Fire Academy.

2. Research on better engineering of breathing apparatus and protective clothing.

3. Federal support for State and local fire inspection programs.

Minority Recommendations

1. Continued support of existing fire programs in the Federal Government.

2. Reduction of the projected total additional fire budget by $100 million during the build-up years and $75 million during the operating years, subject to subsequent review.

3. Retention of the Department of Commerce as the principal focus for the Federal fire effort, in accordance with the provisions of Title I of the Fire Research and Safety Act of 1968.

4. Swift and adequate funding of the Department of Commerce to permit early institution of a massive. multimedia fire safety education campaign.

5. Enactment of new legislation to assign responsibility, for direct support to the fire services, to the Department of Housing and Urban Development, including the establishment of a national fire academy.

6. Creation of a new temporary Commission in 1983 to assess the effectiveness of the Federal fire programs and make recommendations to the President and the Congress for further steps to diminish the Nation's annual toll from fire.

7. Increased use of the oversight function of the appropriate committees to assure assessment of effectiveness and adequate planning by the departments during the interim.

This minority opposes the creation of a new Federal fire agency at this time. During the proposed review in 1983 it would be appropriate to consider whether the Nation's interests would be better served by the establishment of a Federal agency for fire research and education in the Department of Commerce.

This minority urges the President and the Congress in considering these recommendations and those of the majority of the Commission, to use as your yardstick, the probable reduction of life and property losses if the measures suggested are adopted.

In conclusion, I support the position of the majority of the Commission that expanded Federal action is needed in the fire field and that, properly directed, the investment will pay off handsomely, A few final words may emphasize the need:

As grim as were our losses due to enemy action in Vietnam, they were small compared with our Nation's fire casualties for the same period (Fig. 6). Smoke and fire seriously injure 300,000 Americans every year and kill nearly 12,000. How many are 12,000? How many people could you call by name if you met them on the street? 2,000? 4,000? In this Nation, fire and smoke kill more people each and every year than the average person knows and gravely injures more than he has ever met.

Respectfully submitted,

ANNE WIGHT PHILLIPS.

SELF-SCORING THE FIRE SAFETY QUESTIONNAIRE

Questions	*Safety score (points)*
Question 1. If your house began to fill up with thick, black smoke, what would you do? (answer fully)	
If your answer included getting beneath the smoke by crouching or crawling (to evade harmful combustion products), give yourself	3
If your answer included getting out of the house, give yourself	3
If your answer included rousing the rest of the household, give yourself	3
If your answer included calling the first department, give yourself	3
If your answer included opening windows without first closing doors (to keep the air from the fire) subtract 3 points	
Question 2. What would you do if you woke up at night, smelled smoke, and found that your bedroom door was shut, but hot when you touched it?	
If your answer did not include opening the hot door (which would expose you to killing heat), give yourself	4
If your answer included calling for help by phone or from a window, or finding an alternative way out, give yourself	3

Question 3. Will the clothing you have on now burn?

If your answer is yes, give yourself ---------- 3

(NOTE.—It is hoped that in the future this question will have to be deleted, as flame resistant materials become more available.)

Question 4. What would you do right now if your clothing caught on fire?

If your answer included dropping and rolling (to extinguish the flames by smothering them) give yourself ---------- 3

If your answer included running (which fans the flames) subtract 3 points.

If your answer included going to draw water (which takes too long) subtract 3 points.

If your answer included wrapping up in a blanket, coat, or rug, but remaining vertical (thus permitting continued inhalation of smoke), give yourself only ---------- 1

Question 5. If you were trapped in a bedroom on the fifth floor with flames outside in the hall and smoke pouring in under the door (with no telephone and no fire escape), what would you do?

If your answer included stuffing something into the offending crack to reduce the smoke entering the room, give yourself ---------- 3

If your answer included yelling from the window for help, or hanging something out the window to attract firefighters' attention, give yourself ---------- 3

If your answer included jumping, subtract 3 points.

If your answer included opening the window a crack, top and bottom to vent the smoke and you did not leave a door open, so air could reach and fan the fire, give yourself ---------- 2

If your answer included finding better air by keeping low or breathing air from outside the window, give yourself ---------- 2

If your answer included making a rope out of bedsheets, curtains, etc., give yourself ---------- 1

If you said you would make it, but not use it unless forced to, give yourself an additional ---------- 1

Question 6. (a) When you go to a strange place (movie house, friend's house for the night, hotel, restaurant, etc.), do you check to see where the exits or fire escapes are?

If you habitually check the exits when you stay at hotels, inns, motels, etc., give yourself ---------- 1

If you check to see where the exits are when at a restaurant or staying overnight at a friend's house, give yourself ---------- 1

(b) If the answer to 6(a) was yes, do you depend on being able to see the exit to find it, or do you figure out how to find it in the dark or thick smoke?

If your answer to 6(a) was no, give yourself no points for question 6(b).

If your answer to 6(a) was yes, and you do not rely on being able to see the exit signs, but figure out how to find an exit in the dark in thick smoke, give yourself ---------- 1

Question 7. Do you have a family escape plan (including ways of getting out of your house if the stairs or doors are blocked by fire), and a meeting place outside the house?

If you have a way out of your house if the stairs and doors are blocked by smoke, give yourself ---------- 2

If you have a planned place to meet outside the house which the whole family knows about, give yourself ---------- 2

Question 8. What should you do (or should your wife or mother do) if the frying pan catches on fire?

If your answer is to smother the fire with the lid or baking soda or to use a dry powder (all purpose) or CO_2 fire extinguisher,[1] give yourself ---------- 3

(Sand and dirt are acceptable answers if cooking outside).

If your answer is to smother the fire with salt or a wet towel, give yourself ---------- 2

If you threw water on the fire or used a soda-acid fire extinguisher or a water-pump tank type of extinguisher (water may spread the fire over the kitchen), subtract 3 points.

If you attempted to carry the flaming frying pan, which may ignite your clothing, spill, or become too hot to hold, subtract 3 points.

If you threw flour, which explodes, at the fire, subtract 3 points.

Question 9. Carbon monoxide is produced by almost all fires. What effect does it have on you before it makes you sleepy and kills you?

If your answer reported that carbon monoxide has no effect, or that it makes you cough, your eyes water, or smells badly, subtract 2 points. It has no color, taste, or smell and gives you no warning of its presence, but it is NOT harmless.

If your answer indicated that carbon monoxide distorts your judgment, give yourself ---------- 2

(Victims of carbon monoxide poisoning may make irrational attempts at escape, or may waste vital minutes saving items of little or no value. People who have been in a burning building for some minutes should be watched, to be sure they do not go back into the fire)

If your answer indicated that carbon monoxide disturbs your coordination (making simple escape efforts, such as unlocking a window difficult, or impossible), give yourself ---------- 2

Question 10. Assume you plan to hang by your hands from a window ledge and then drop to the earth below. Estimate in feet the distance you could drop and still have a 50:50 chance of surviving without serious injury.

Score yourself in accordance with the following table: If your answer was—

Less than 20 feet: score	3
More than 20 feet, but less than 25 feet: score	1
More than 25 feet, but less than 35 feet: score	0
More than 35 feet, but less than 50 feet: subtract	2
More than 50 feet: subtract	3

Add 1 point if you have had training as a parachute jumper.

Subtract 1 point if you are over 50 years of age, unless your answer was under 15 feet.

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[1] The pressure on a CO, extinguisher is generally about 600 lbs.; Pressure on an all purpose extinguisher is generally about 300 lbs. Stand off from the fire 7 or 8 feet.

Question 11. (*a*) *What is the reason for having fuses in an electric circuit?*

If your answer indicates that the purpose of a fuse is to prevent a fire (by "blowing" before the wires can overheat when too much of a load is put on them), give yourself_____ 3

(*b*) *What strength fuse should be used in an ordinary lighting circuit?*

If your answer advised a 15 amp. fuse, give yourself _____ 3

If your answer advised a 30 amp. fuse, subtract 3 points.

Question 12. What number should you dial to report a fire by telephone, and how should you report it?

If your telephone area is on the 911 emergency system, and you wrote down 911, or

If you gave the correct number for your local fire department, give yourself_____ 1

If you said you would give the location of the fire slowly and clearly, give yourself_____ 1

If you said that you would stay on the line to give additional information requested by the fire department, if you could do so safely, give yourself _____ 1

If the number you called (police or "operator") would result in a delay in transmitting the message to the fire department, give yourself only__ 1

If you gave the wrong number, either for the fire department, or the police, or left the question unanswered, subtract 3 points.

Question 13. When is an electric cord dangerous? (*give at least two examples*)

If you listed any two of the following, give yourself _____ 3

When it is frayed;

When the insulation has worn off;

When it is wet;

When it is under a rug (where repeated walking on it may break the insulation);

When it is run over a nail (where the insulation may break at the bend);

When it is run through a doorway (where closing the door may cause a break in the insulation);

When it is pulled out of a wall socket by the wire, instead of by holding onto the plug, so there is danger of one of the wires coming loose and touching the other; and

When nails are driven into it.

Question 14. When is a double plug dangerous?

If your answer included: When it is broken or when it is wet, give yourself_____ 1

If it included when it is overloaded, (by having many appliances plugged into it or two heating appliances plugged into it), give yourself__ 3

Question 15. What should you do if you discover a large fire in your basement?

If your answer included:

Shutting the basement door, give yourself_____ 3

Calling the fire department, give yourself_____ 3

Getting everyone, including yourself, out of the house, give yourself_____ 3

If your answer included trying to fight a basement fire yourself, subtract 2 points. If it included fighting the fire yourself without having notified the fire department, subtract 3 points, instead of 2.

Question 16. If you are trying to light a gas oven or burner and the first match goes out too soon, what should you do?

If your answer included turning off the gas before lighting a second match (so that explosive quantities of gas would not accumulate in the oven or burner to be set off by the second match), give yourself_____ 3

If you made sure the first match was completely out, by breaking it or touching the tip, before discarding it, give yourself_____ 1

Question 17. What is meant by "spontaneous combustion" or "spontaneous ignition"?

If your answer described the ignition of substances (such as wet newspapers, oily rags, paint-covered wipe cloths, and damp hay), which generate their own heat and ignite without the application of an external heat source, give yourself_____ 2

Question 18. How should you store oily or greasy rags?

If you answered that they should not be kept or

If you said they should be kept in a closed metal container, give yourself_____ 3

Question 19. Why should gasoline be stored only in metal cans with self-closing caps?

If you answered:

To prevent fires, give yourself_____ 3

Because metal cans will not break readily, give yourself _____ 3

If you answered to prevent fumes from spreading across the floor (which may be ignited by a spark, cigarette, or hot furnace), give yourself__ 3

Question 20. Should you put out an electric fire with water?

If you answered no, give yourself_____ 3

Add up your points to determine your fire safety score. Maximum possible score=100 (101 for parachute jumper).

Appendix B
America Burning Revisited

AMERICA BURNING

REVISITED

NATIONAL WORKSHOP

TYSON'S CORNER, VIRGINIA

NOVEMBER 30 - DECEMBER 2, 1987

Federal Emergency Management Agency
United States Fire Administration

Introduction

In 1973, the presidentially appointed National Commission on Fire Prevention and Control published ***America Burning***, its landmark report on the nation's fire problem. The report presented 90 recommendations for a fire-safe America. For the past 15 years, ***America Burning*** has served as a road map, guiding the fire service and the federal fire programs toward the goal of improving fire safety in the United States.

The original ***America Burning*** report made 90 recommendations in 18 chapters in the following general subject areas:

- the nation's fire problem;
- the fire services;
- fire and the built environment;
- fire and the rural wildlands environment;
- fire prevention; and
- a program for the future.

While much of the report and its recommendations remained valid and relevant, it was time to take a second look at ***America Burning*** and re-examine the progress made toward the goals and objectives stated in the report. Perhaps more importantly, it was time to make new recommendations that would reflect the changes in our society and environment since 1973, but still move toward a more fire-safe America.

As a result, the conference on "America Burning Revisited" was convened in the suburbs of Washington, D.C., from November 30 to December 2, 1987.

Purpose

"America Burning Revisited" had a threefold purpose. First, conference participants were to reach a consensus about the status of, and trends in, America's fire problem. Second, they were to revisit ***America Burning*** by reviewing and evaluating the progress toward the report's 90 recommendations. Finally, the conference participants were to recommend guidelines for local, state and federal efforts to reduce the life and property loss from fire.

The U.S. Fire Administration (USFA) planned to use the results of this conference as the basis for establishing its program priorities for future activities. This meant that the fire protection leaders participating in "America Burning Revisited" were to have the opportunity to map out the future course of fire safety in this country.

Workshop Structure

The participants invited to "America Burning Revisited" came from major professional, business and governmental organizations with an interest in fire protection. This included representatives of the fire service, the building materials industry, fire protection engineering, burn treatment centers, testing laboratories, labor, academia, building code groups, associations of local government officials, the housing industry, the elderly, private industry, and local, state and federal government, including the U.S. House of Representatives.

James F. Coyle

The conference participants were divided into seven work groups coinciding with selected chapters from the original *America Burning* report. A listing of the task group titles and topics follows:

- **Task Force 1. The Nation's Fire Problem**

Topics included causes, social changes, prevention issues, federal role, data collection and reporting, burn treatment and the role of the insurance industry.

- **Task Force 2. The Fire Services: Operations**

Topics included all field operational matters, for example, current missions and services of the fire service, alternative service delivery mechanisms, incident command, tactics, training, equipment, apparatus, and fire fighter health and safety.

- **Task Force 3. The Fire Services: Management and Administration**

Topics included all headquarters staff responsibilities, for example, budgeting, financing, master planning, personnel (Fair Labor Standards Act, etc.) and productivity.

- **Task Force 4. Fire and the Built Environment**

Topics included current hazards, codes and standards, transport (aircraft, motor vehicle, marine, etc.), commercial and industrial fires, causes and remedies, how people die in fire, hazards through design, and product design.

- **Task Force 5. Fire and the Rural Wildlands Environment**

Topics included volunteer issues, urban/wildland interface, and forest and grassland fire protection.

- **Task Force 6. Fire Prevention**

Topics included fire safety education, home and workplace fire safety, built-in protection, public and private sector cooperation, and special population protection.

- **Task Force 7. Preparing for the 21st Century**

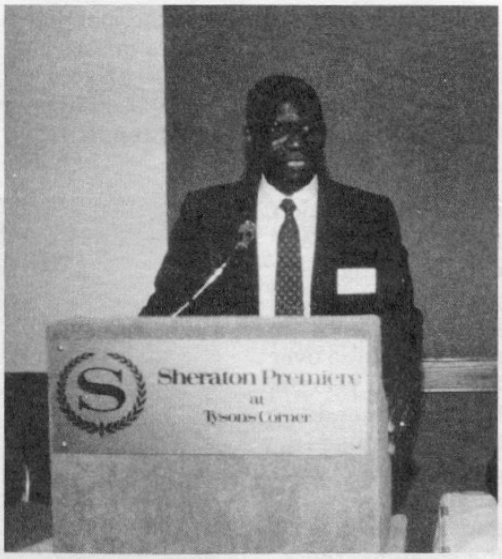
Topics included research needs, federal involvement, and private and public sector involvement.

Each task force was assigned four identical tasks. They were to review the issues as stated in ***America Burning***; identify new problems, concerns and issues; develop alternative solutions; and recommend actions for consideration by all participants.

Conduct

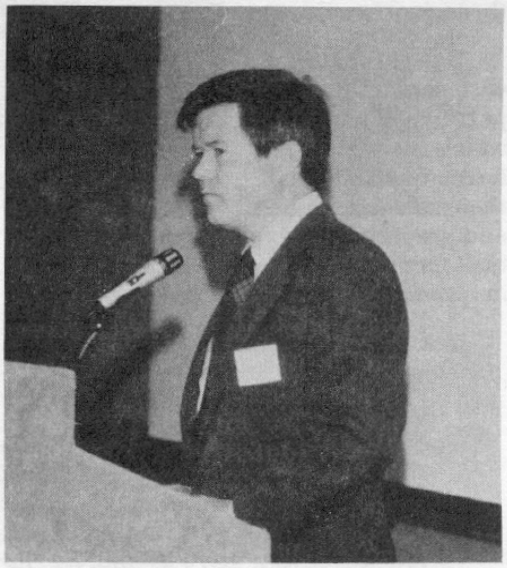
The conference began with a welcome from Julius W. Becton, Jr., the director of the Federal Emergency Management Agency.

Participants then were given several in-depth background presentations to help form or strengthen their frames of reference. "America Burning - The Past" was discussed by Lou Amabili, director of the Delaware State Fire School and a former member of the National Commission on Fire Prevention and Control. The administrator of the U.S. Fire Administration, Clyde A. Bragdon, Jr., talked about "America Burning - The Present." Finally, Dr. John Granito presented "America Burning -The Future." (Summaries of the Amabili, Bragdon and Granito presentations appear in the beginning of Section V of this report.)



Julius W. Becton

After the conference charge by U.S. Representative Doug Walgren (D-PA), chairman of the House Science, Research



Congressman Doug Walgren

and Technology Subcommittee, participants divided into task forces for session one on problem identification. (Excerpts of Congressman Walgren's speech appear throughout Section V of this report.)

Day two of the conference (session two) concentrated on comparing the problems identified in session one with progress made over the past 15 years on the recommendations contained in ***America Burning***. Along with several general and reporting sessions, the participants, in their task forces (session three, part one), also began to work on solutions to those problems.

Jim Estepp

Day three began with session three, part two, during which the task forces finalized their solution strategies and prepared their final reports. Each task force then presented its final report in a concluding general session.

In addition to the presentations mentioned above, the conference participants heard luncheon speeches from U.S. Representative Curt Weldon (R-PA), chairman of the Congressional Fire Services Caucus, and Chief M.H. "Jim" Estepp of the Prince George's County (Maryland) Fire Department. Remarks by U.S. Representative Sherwood P. Boehlert (R-NY) were presented by his aide, David Golston. Mr. Bill Honsell, Executive Director of the International City Management Association also spoke. Excerpts of the Weldon and Boehlert speeches appear throughout Section V of this report.

Before beginning the report of the conference, however, it is appropriate to set the stage with the information in Section II, "The Current and Projected Future Fire Protection Environment."

This report was produced by Wilkins Systems, Inc. The authors were Colin A. Campbell and Lee Feldstein. The editor was Colin A. Campbell. Section II, "Current and Projected Future Fire Protection Environment," and Appendix C, "Status Report on the 90 Recommendations from ***America Burning,*** *" were written by Harvey Ryland.*

Current and Projected Future Fire Protection Environment

Introduction

This report contains a general discussion of the current and projected fire protection environment in the United States. The report includes information on:

- changes in fire experience, problems, issues and conditions since ***America Burning*** (the report of the National Commission on Fire Prevention and Control was published in 1973);
- current fire losses, major problem areas, programs and general conditions which directly, or indirectly, affect the protection of life and property from fire; and
- projected future (i.e., 1990 - 2020) conditions and situations at the local, state and national levels which might impact on fire protection.

General Trends 1973 - 1987

There have been significant changes in the field of fire protection since 1973. For example:

- Fires and fire losses have declined generally over the period 1973 - 1987. There are some exceptions to this trend that are discussed in Section 3.
- In general, fire departments have experienced major changes in such areas as emergency response activity, available resources, fire fighter duties, requirements of the Fair Labor Standards Act (FLSA), volunteer recruitment and retention, and liability for personal and departmental actions.
- The United States Fire Administration (USFA), National Fire Academy (NFA) and Center for Fire Research (CFR) of the National Bureau of Standards (now the National Institute of Standards and Technology [NIST]) were established and have been operating for 14 years.
- The Consumer Product Safety Commission, U.S. Forest Service, General Services Administration, Department of Housing and Urban Development, Department of Health and Human Services, and other federal agencies have conducted programs to reduce fire losses and improve the effectiveness of fire protection.
- Building and fire codes have been strengthened, especially involving smoke detectors and automatic detection and suppression systems.
- There is a greater use of exotic materials, including those which produce toxic gases when burned.
- Fire fighter health and safety has been improved through physical fitness programs, new breathing apparatus (and its mandatory use), and clothing and protective equipment.

Fire Experience

In 1975, there were an estimated 8,100 fire deaths[1], with 6,200 in 1985, a reduction in annual deaths of 1,900, or 23%. This decline in fire deaths is illustrated in Figure 1. The decrease is even greater when figured on a per capita basis, as shown in Figure 2. On a cumulative basis, this decrease represents an estimated saving of 6,900 lives over the period 1975-1985.

Fire fighter fatalities also have been decreasing. The annual number of fire fighter deaths (including line-of-duty deaths resulting from activities other than fighting fires, for example, training, station duty and responding to non-fire incidents) over the period 1979-1985 is illustrated in Figure 3. These reductions appear to result from a decrease in fire fighter deaths caused primarily by asphyxiation, probably as a result of increased use of breathing apparatus. It should be noted that heart attacks are responsible for approximately 50% of fire fighter deaths. Approximately 50%-60% of fire fighter fatalities are related directly to fire incidents.

Figure 1.

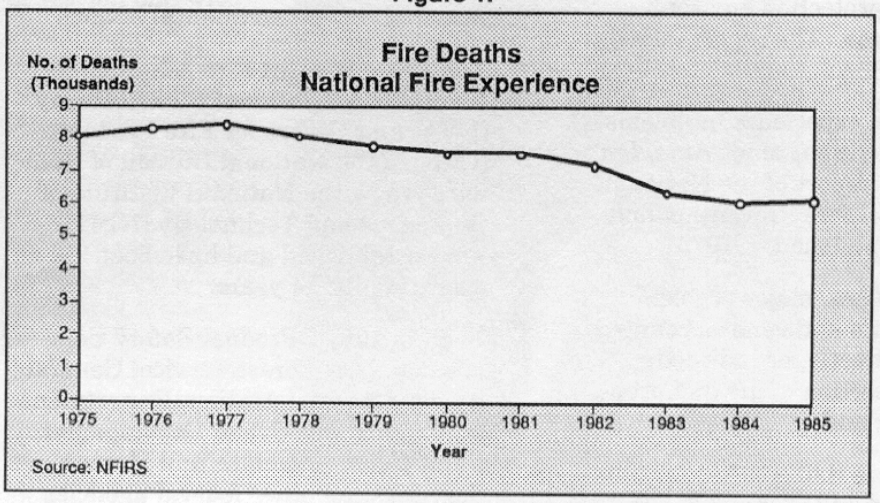
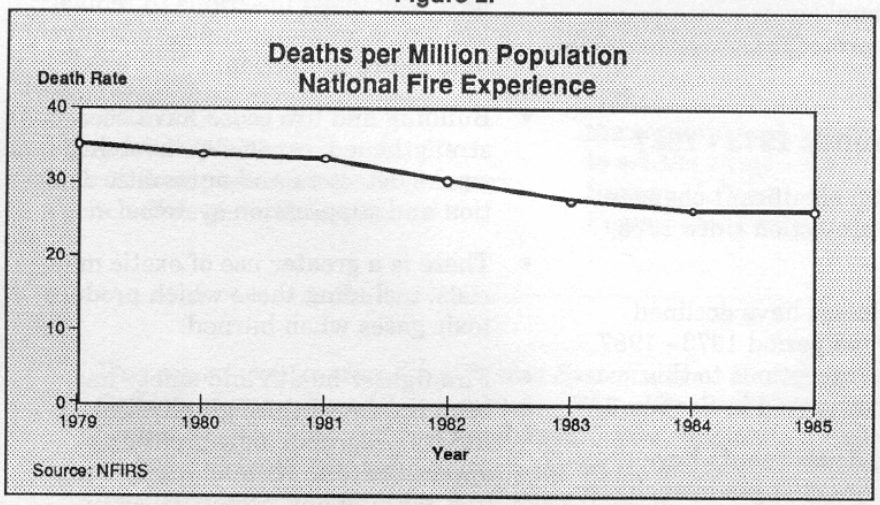


Figure 2.



[1] All data used in this report were supplied by the National Fire Data Center, USFA.

The fatality rate for career fire fighters is 255 deaths per million workers, second only to mining which has a rate of 301 deaths. The rate for volunteer fire fighters is 25 deaths per million workers. However, the career fire fighters' risk of death cannot be compared directly to that of the volunteers on the basis of deaths per million workers. This is because most volunteer fire fighters do not work as fire fighters full time. Therefore, they are exposed to risk for less time than career fire fighters.

While fire deaths have been decreasing, fire-related injuries have remained relatively constant, even when considered on a per capita basis. The reasons for the lack of decrease in injuries are not known.

Even greater reductions in fire deaths have been achieved within special categories. Clothing fire deaths have fallen by 73% over the period 1968-1983, as shown in Figure 4. In addition, children's clothing fire deaths have dropped by 90%. These decreases are felt to be a result of flammable fabric standards developed and implemented by the National Institute of Standards and Technology and Consumer Product Safety Commission. Prior to the adoption of the

Figure 3.

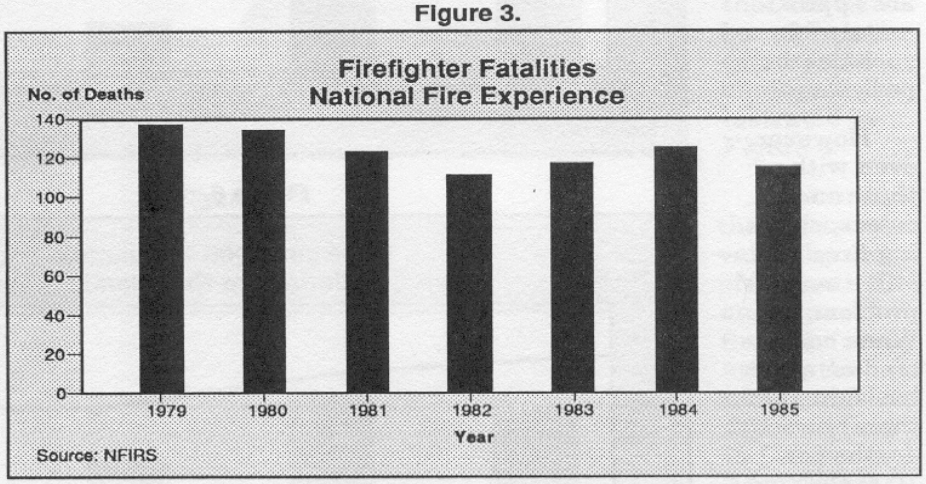
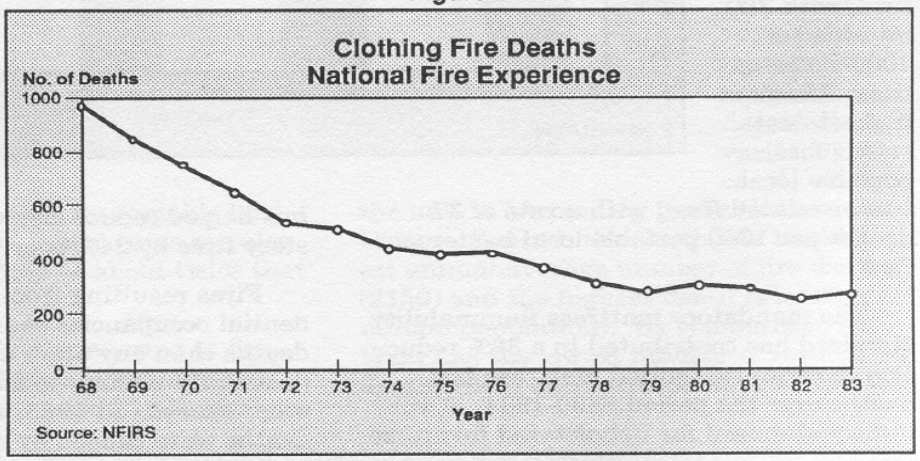
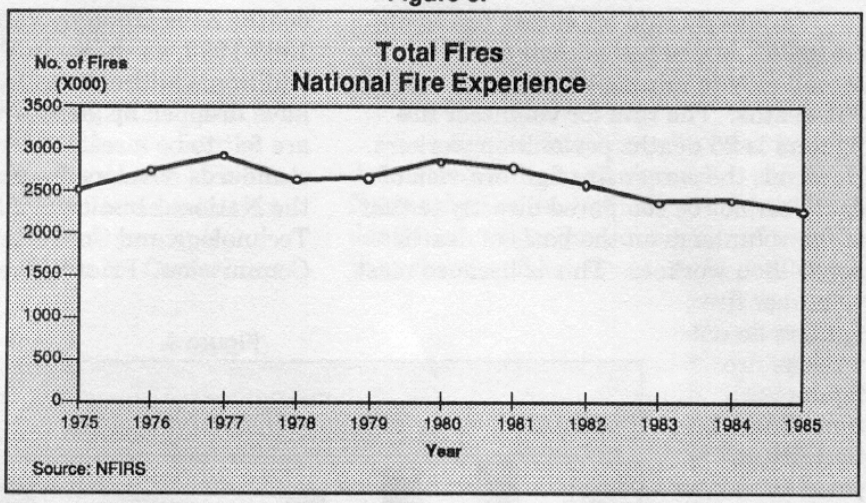


Figure 4.



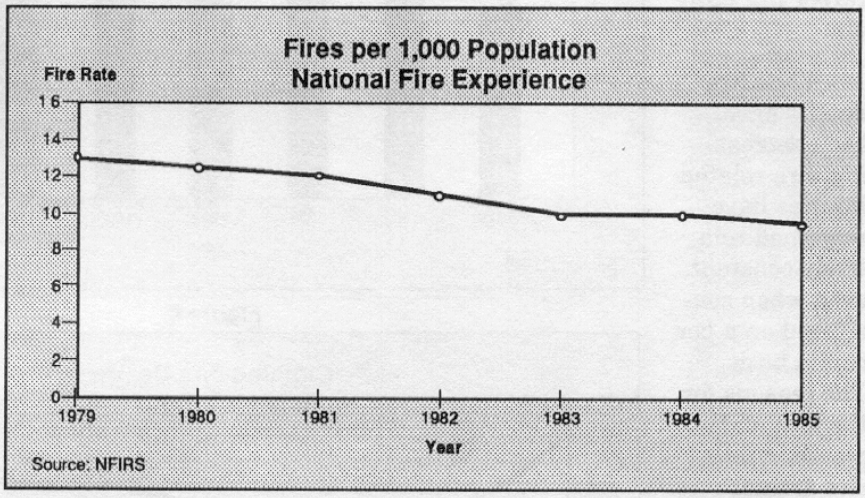
mandatory children's sleepwear standard, there were approximately 60 child sleepwear-related fire deaths per year; now there are approximately two such deaths per year.

Figure 5.



However, even with these successes, clothing fires are still a serious problem. When considered on a risk basis, in 1985, there were 102 deaths per 1000 clothing fires, with 360 injuries per 1000 clothing fires. The next highest death rate is for portable local heater-related fires, with a rate of 37 deaths per 1000 portable local heater fires.

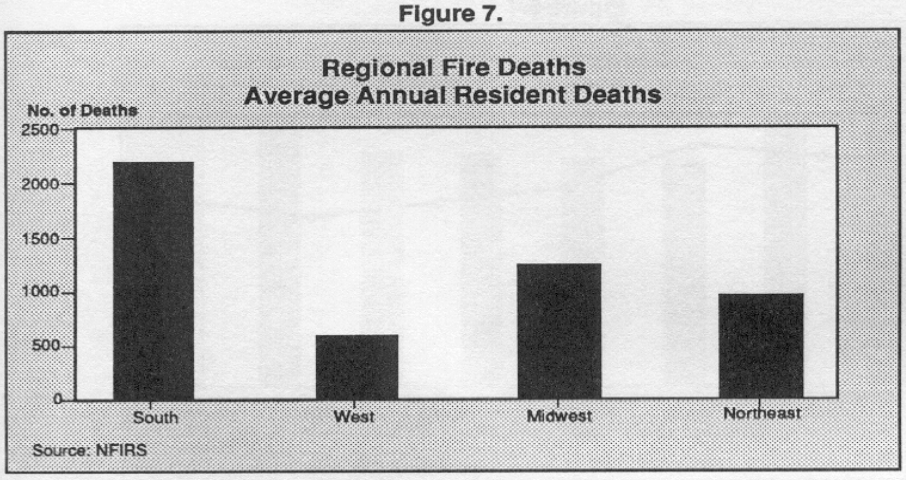
Figure 6.



The mandatory mattress flammability standard has contributed to a 32% reduction in cigarette-ignited mattress fire deaths over the period 1980-1984. A voluntary standard for upholstered furniture has helped reduce cigarette-ignited upholstery fires by 24% over this same period.

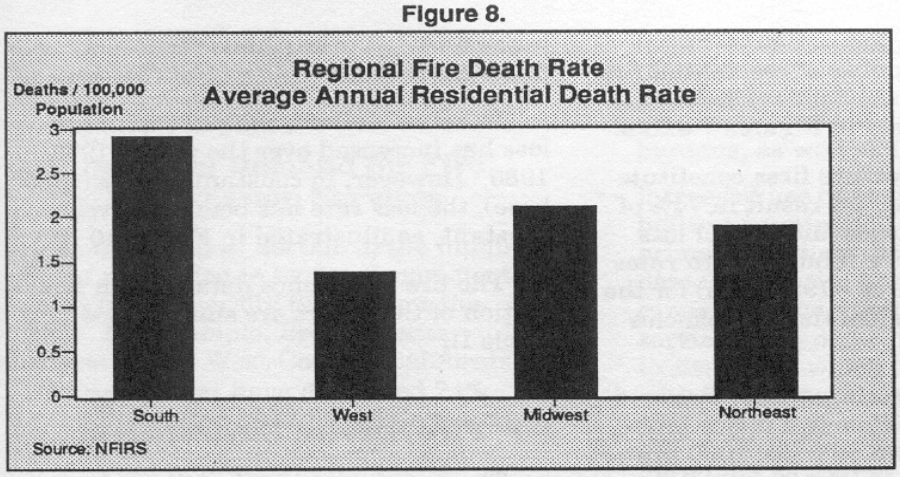
Fires resulting from smoking in residential occupancies cause more fire deaths than any other single factor. This death rate is three to four times that of other causes. In 1985, 17.4% of all fire deaths were caused by smoking fires,

Figure 7.



presented in Figure 5. The number of reported fires has been decreasing even though the population is increasing, which means that the number of fires per capita is declining, as illustrated in Figure 6.

Figure 8.



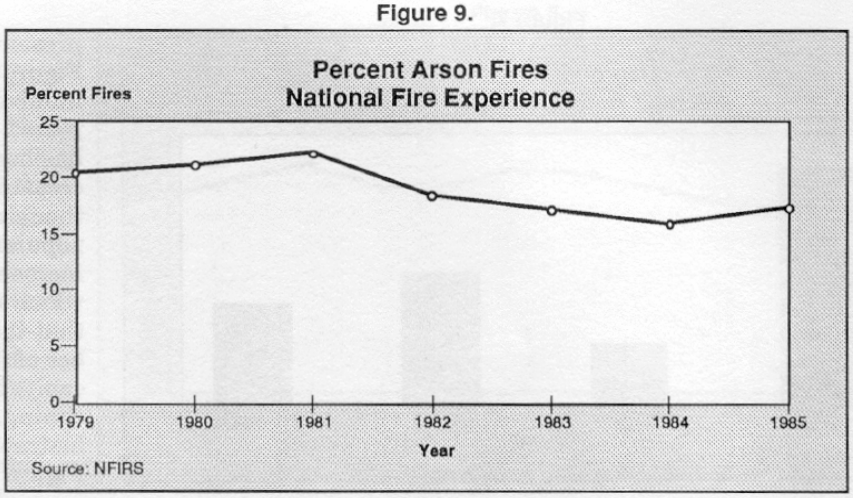
Of course, the fire trend varies by area of the nation and type of fire. For example, the number of reported fires in California has declined 24% over the 1975-1985 period. The residential fire death rate varies significantly across the nation. According to the Centers for Disease Control, the South has the highest annual average number of fire deaths (2150) and the highest death rate (29 per million population). By comparison, the West has the lowest number of residential deaths (585) and corresponding rate (14

with fire deaths caused by portable heaters second at 3.1%. Injury rates are also high for smoking fires — about twice that of other causes.[2]

The number of fires reported to fire departments has decreased by approximately 20% over the period 1975-1985, as

[2] This decline must be considered in light of the declining percentage of smokers in the country. According to the American Heart Association, the percentage of smokers declined from 43% to 32% over the period 1966-1983. (***Cigarette Smoking and Cardiovascular Disease***, American Heart Association, 1985)

Figure 9.



deaths per million population). The average annual number of residential fire deaths and per capita death rate for each region are illustrated in Figures 7 and 8.

Residential structure fires constitute only 25% of all fires, yet result in 74% of deaths, 62% of injuries and 43% of loss (1985 data). The fire-related death rates (deaths per 1000 fires - 1985 data) for the various types of residential occupancies are listed in Table I.

Fire deaths in rooming, boarding and lodging houses are clearly a major problem when considered on a per 1000 fire basis. However, in absolute terms, there are more fire deaths in one- and two-family dwellings and apartments.

The percentage of fires which are considered to be of incendiary or suspicious origin has been declining slightly, as shown in Figure 9. Because the total number of fires also has declined, this represents a decrease in the average annual number of arson fires. The percentages of arson fire-related deaths, injuries and dollar loss have remained fairly constant.

In actual dollars, the per capita fire loss has increased over the period 1979-1985. However, in constant dollars (1985 base), the loss rate has been relatively constant, as illustrated in Figure 10.

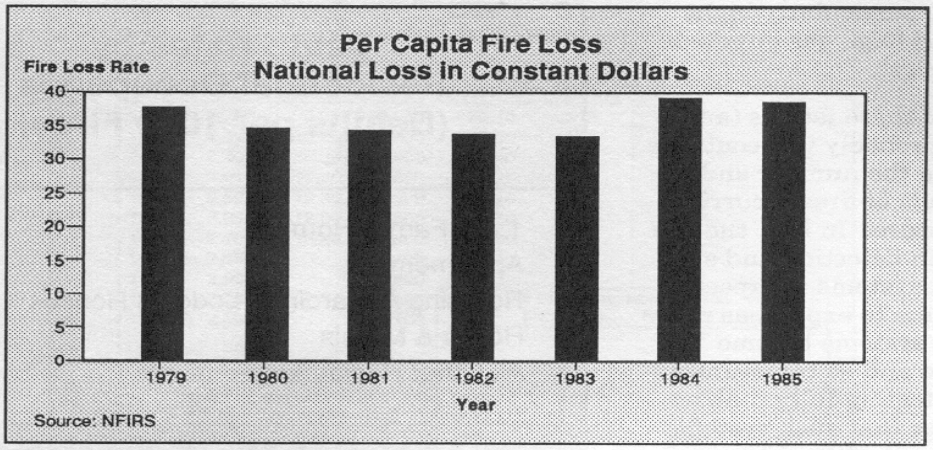
The fire experience data used in this section of the report are summarized in Table II.

Fire Service Environment

The fire service is going through a period of significant change. In fact, the degree of change is so great that it might be called "revolutionary" change instead of "evolutionary."

This change is felt to be primarily a result of three major factors: a) declining demand for fire suppression services; b) increasing demand for emergency medical services (EMS), hazardous materials protection, disaster preparedness and related

Figure 10.



functions; and c) increasing competition for available local government resources.

Declining Demand for Fire Suppression Services

As discussed in Section 3, the number of fires responded to by fire departments is declining generally throughout the nation. For example, fire incidents handled by the West Covina (California) Fire Department have decreased 24% during the period 1977-83, while the city grew by 40%.

Fires are not only going down in total, but also on a per capita basis (as shown in Figure 6). The exact reasons for this dramatic decrease in the number of fires have not been established quantitatively. However, they are felt to include a complex interaction of the following factors:

- improved fire prevention and public education programs conducted by fire departments and fire service personnel;
- improved building/fire codes;
- improved plan check and inspection programs conducted by fire prevention bureaus, as well as fire companies;
- increased use of smoke detectors and built-in suppression systems (which primarily reduce the extent of fire damage, injuries and deaths, but also can reduce the number of calls for service when detectors alert occupants to situations which then are handled without calling the fire department);
- improved public education programs for adults as well as juveniles;
- increased awareness of fire danger (for example, resulting from the MGM Grand Hotel fire);
- decreased numbers of people under age 25, thus reducing the number of individuals who might participate in juvenile firesetting; and
- improved national economy (however, if the economy declines, there may be a noticeable increase in the number of

fires, particularly high-priced [e.g., gas guzzler] vehicles).

All of these factors (and others) probably will continue to reduce the number and magnitude of fires occurring in the future. In fact, the use of built-in detection and suppression systems is expected to continue to expand as new low-cost systems become available and as community administrators fully realize the power that such systems have to control the long-term costs of fire suppression. Not only will more and more construction include built-in suppression systems, but the trend to retrofit existing buildings is increasing. Several communities have passed retrofitting laws for specific occupancy types (hotels, for example), and several cities have considered retrofitting the entire community.

A number of jurisdictions have adopted fire sprinkler standards which require that all new construction (sometimes excluding single family dwellings) be fitted with a sprinkler system. Some communities require sprinklers in all new construction exceeding a given height or area.

Thus, it is considered probable that many communities will be protected by automatic detection and suppression systems at some time in the future. As a result, the demand for structural fire suppression will be limited to extinguishing fires in the room of origin, and incidents involving explosions, arson or other situations where automatic systems are turned off or defeated.

Table I.

Death Rates by Residential Occupance (Deaths per 1000 Fires)

1 & 2 Family Homes	8.1
Apartments	7.9
Rooming / Boarding / Lodging Houses	28.9
Hotels & Motels	9.1
All Other Residences	4.0

Even though many new and existing buildings will be protected by built-in systems, it probably will be a long time before structures in lower socio-economic areas (e.g., inner-city and rural neighborhoods) have such protection. Right now, those areas experience a disproportionate share of fires and related deaths. For example, the previously discussed high fire death rate for the South occurs in a region which has fewer smoke detectors in homes, higher usage of portable heating equipment and a larger percentage of persons below the poverty level. Thus, it will be very difficult to get such dwellings equipped with automatic detection and suppression systems.

Fire suppression services will be required for vehicle and wildland fires, as well as for such fire-related activities as evacuation/rescue, overhaul and salvage, and hazardous materials incidents. However, it is possible that the number of vehicle and wildland fires also will decrease in the future. Vehicles are being designed to be less susceptible to fire, and a number of programs are being consid-

Table II.

Summary of Fire Experience Data

Year	Fires (x000)	Fires / 1000 Population	Deaths	Deaths / Million Population	Firefighter Fatalities
1985	2,300	9.68	6,200	26.10	113
1984	2,400	10.20	6,200	26.30	123
1983	2,400	10.30	6,400	27.40	118
1982 [1]	2,613	11.30	7,200	30.20	110
1981	2,825	12.30	7,600	33.10	122
1980	2,890	12.80	7,600	33.60	133
1979	2,700	13.20	7,800	34.80	137
1978	2,690		8,100		
1977	2,960		8,500		
1976	2,780 [2]		8,400		
1975	2,600		8,100		

Year	Per Capita Loss (Constant $)	Injuries / Million Population	Clothing [3] Fire Deaths
1985	38.30	463	
1984	38.80	446	
1983	33.20	471	270
1982	33.50 [4]	425 [5]	260
1981	33.80	379	305
1980	34.20	393	311
1979	37.30	408	290
1978			325
1977			376
1976			426
1975			429
1974			445
1973			517
1972			542
1971			657
1970			750 [6]
1969			843
1968			977

Year	Arson [7] (% of Fires)	Residential Deaths / 1000 Fires (Caused by Smoking)
1985	17.20	21.50
1984	15.80	30.00
1983	17.10	27.20
1982	18.30	27.60
1981	22.00	26.20
1980	21.00	24.70
1979	20.02	24.80

1 Interpolated Data
2 Interpolated Data
3 Some Data May Be Incomplete
4 Interpolated Data
5 Interpolated Data
6 Interpolated Data
7 Includes Incendiary and Suspicious Fires

ered and/or implemented to minimize the consequences of wildland fires. For example:

- conducting prescribed burning to reduce fuel loading;
- converting fuel to less combustible types;
- creating greenbelts as fire breaks;
- restricting the use of combustible roofs; and
- requiring brush clearance around structures.

In addition, continued development reduces the amount of wildland acreage which is at risk. A contrary trend is that more structures are being built in the urban-wildland interface areas. Development in these areas means that more structures will be at risk and fire fighters increasingly will be faced with the dilemma of choosing between protecting exposed buildings or controlling the wildfire.

As a result of all of these factors, the overall demand for fire suppression services is expected to decrease in the future. However, the demand for *fire protection* will continue and possibly even increase as the effort is shifting to fire prevention and public education duties. Duties which are expected to increase (es-

U.S. Representative Curt Weldon (R-PA)

"...We have not done enough to sensitize the members of Congress, who are being inundated with requests from special interest groups, to the ongoing needs generated by your day-to-day problems."

pecially as the number and complexity of codes increases) include:

- reviewing proposed developments;
- reviewing construction plans (particularly for automatic detection and suppression systems);
- monitoring and inspecting construction and testing systems;
- conducting final inspections and issuing certificates of occupancy;
- conducting on-going inspections and corresponding codes;
- organizing and conducting public fire safety education classes; and
- creating and maintaining a high level of public awareness concerning fire prevention and fire safety.

Increasing Demand for Emergency Medical Services

The demand for emergency medical services (EMS) generally has been increasing in communities throughout the nation. It is not unusual for EMS incidents to constitute 80%, or more, of a fire protection agency's emergency responses. This demand is expected to continue to increase in the near term and then may level off or possibly even decline in the future. The increase is expected to be a result of heightened awareness of the availability of the service and the general aging of the population. The leveling off could occur because of generally improved health and "built-in protection." For example, pacemakers have been used for years, systems to internally inject medicine are in use and internal defibrillators soon will be available. Life-threatening calls for service may decline with these advances, but the greying of our population is likely to increase the per capita demand for emergency medical services.

Increasing Demand for Hazardous Materials Protection

The role of the fire service in hazardous materials protection has increased significantly over the past decade, and this role is expected to continue into the future. Hazardous materials incidents usually result from accidents that occur in the storage, transporting or processing

of chemicals which endanger life or the environment, or lead to fire or explosion. Chemical spills associated with the transportation of hazardous materials (primarily truck or rail) have resulted in major disasters for even small communities and rural areas.

The severity of the hazardous materials problem from a national perspective is indicated by a statement in the ***Hazardous Materials Planning Guide*** (National Response Team publication NRT-1): "Recent evidence shows that the hazardous materials incidents are considered by many to be the most significant threat facing local jurisdictions."

The fire service originally became involved in hazardous materials because fire departments are usually first responders to most types of disasters. However, the fire department role has become more formalized as a result of local policies, and state and federal legislation.

At the federal level, the new legislation ("Emergency Planning and Community Right-to-Know Act of 1986" - Title III of the Superfund Amendments and Reauthorization Act) requires fire department involvement in a formal and extensive way. Under this legislation, fire departments are assigned a major role in preparing for, and responding to, hazardous materials incidents. Specifically, fire departments are designated to be represented on "Local Emergency Planning Committees" and to receive "Material Safety Data Sheets" (MSDS) containing information about hazardous materials in the community. The analysis, storage, retrieval and use of the MSDS is a responsibility for which many departments are not prepared, and may never have the resources to handle.

U.S. Representative Doug Walgren (D-PA)

"Even with the reduction in fire deaths, we still lose, if the loss could be dramatized, the equivalent of two fully loaded 747s colliding in mid-air every month - month after month after month."

Increasing Demand for Disaster Preparedness

Fire departments are generally the first responders to almost every kind of disaster, including natural and technological hazards, and even domestic terrorism and foreign attack. In addition, many departments are using the Integrated Emergency Management System (IEMS) concept, which includes the fire service as a primary component of all four phases of emergency management: mitigation, preparedness, response and recovery.

Declining Community Resources

There are several factors which are interacting to limit community resources available to support the fire services. These factors are:

- taxing limitations (e.g., California's Proposition 13);
- spending limitations (e.g., California's Proposition 4);
- competition with other community services for resources which are available; and
- declining federal contributions (e.g., revenue sharing).

Competition for remaining funds is heavy, with social services constituting a major rival to the fire service. Moreover, it is predicted that the demand for social services will increase significantly in the future because of the demographic aspects of population, including the aging of the population.

Within the next 20 - 30 years, the average life span may be increased substantially. This would result in an older, larger population, causing a greater demand for community services. As a result, it is projected that communities will concentrate available resources on social services (e.g., housing, adult education, welfare, etc.) and will mitigate the demand for other services to the maximum extent possible. It is felt that fire protection offers the best opportunity for demand mitigation (among all community services) because of the success of automatic detection and suppression systems and fire prevention activities. It might be said that the fire service has been so successful that it has reduced the demand for its services. In fact, there is nothing equivalent to a "sprinkler" for any other community service.

Community officials are beginning to realize the power that these systems have to reduce future costs. They will be taking actions to ensure that all new structures are equipped with sprinklers and then will move to retrofit existing buildings. In some cases, this will constitute a major policy shift. That is, in the past, administrators may not have supported automatic detection and suppression ordinances because of political pressure. However, it is felt that this position will change to enthusiastic adoption of such ordinances because it is an almost guaranteed way to achieve significant future cost avoidance.

The potential for long-range cost avoidance is not escaping the attention of community leaders, especially with decreasing per capita revenues and increasing demands for other services. Thus, there probably will be fewer additional fire fighters hired by fire departments than there would be under traditional forms of providing fire protection; and, these individuals probably will be performing a different mix of current duties, as well as assuming new responsibilities. Fire suppression services probably will always be required for rescue, evacuation, overhaul and salvage, as well as to fight those fires which are not extinguished by automatic suppression systems.

These changes will have a major impact on the fire services, and the anticipation and planning for this situation must begin now.

Regionalization

There is a general national trend toward the consolidation of fire protection services to save money, improve effectiveness and efficiency, and increase levels of service.

While quantitative information on the number of consolidations that have occurred could not be located, numerous examples of consolidation were identified in California, Colorado and Florida.

In addition to full jurisdictional consolidation, there are even more instances of partial consolidation, meaning the jurisdictions do not merge, but one or more services are shared or contracted out to another organization. Examples of partial, or functional, fire department consolidation are:

- communications/dispatch;
- apparatus purchase and/or maintenance;
- supplies purchasing and/or warehousing;
- fire cause and/or arson investigation;
- training;
- personnel recruitment;
- workers compensation and liability insurance coverage;
- fire prevention plan checking and inspection services;
- public education;
- data collection and analysis; and
- general management and administration.

Thus, the partial and full consolidation of fire jurisdictions is a component of the current fire protection trend which must be considered in planning for the future.

Summary of Trends

Fire protection is indeed in a period of significant change. Changes may occur which produce major shock waves, especially because of the traditional nature of the fire service. Yet, it is felt that these changes are probable and, in some cases, inevitable. At best, attempts to stop the changes only will delay what is occurring and might create situations where the fire service loses control of planning, policy development or even operations.

These changes do not mean the end of the fire service or even the end of fire suppression. They mean only that the type and level of effort dedicated to specific kinds of services will change, and to a greater extent in some communities. For example, the effort devoted to fire prevention (including public education) will increase, while the effort needed for suppression will decrease. Suppression services will be needed to respond to the fires that do occur, even in fully sprinklered buildings. However, in such structures, fire fighters seldom should have to fight a fire after it has reached flashover. The fires that do reach flashover probably will involve arson, explosion or other catastrophic failure. Thus, strong inspection/enforcement and arson control programs always will be needed (the determined arsonist likely will be able to defeat built-in systems). Fire suppression services also will be needed for wildland and vehicle fires.

The demand for emergency medical services is expected to increase over at least the foreseeable future. In addition, fire departments might assume additional duties which are extensions of more traditional activities. There is a trend developing for fire departments to assume responsibility for total building and environmental inspections. For example, the Environmental Protection Agency has determined that Radon gas can be a life-threatening problem in structures. If past trends continue, fire departments could be given a major role in dealing with this situation.

In aggregate, these changes will benefit the public because the protection of life and property will be increased significantly. To illustrate this conclusion, consider the case of the Disney World complex, a community with an area of approximately 43 square miles, day population of 200,000, night population of 25,000 and an assessed valuation of approximately two billion dollars. This complex is fully equipped with automatic detection and suppression systems. Over the last 15 years, the fire loss for Disney World has averaged $5,000 per year (including water damage), with no fire-related injuries or deaths.

Fire fighters also will benefit from these changes by having a safer working environment; job-related injuries and deaths should decrease significantly in the future because it is safer to fight a fire before it has reached flashover. Also, currently employed fire fighters will benefit by retaining existing jobs and compensation. It is almost certainly true that a growth in the number of fire fighter positions generally will not occur. Thus, it is in the best interests of the fire protection community to work together to recognize the changing environment and evolve to meet future requirements and conditions in the most effective and efficient manner. Moreover, no matter how good the projections of the future are, there always will be new challenges facing the fire protection community, situations that we cannot even conceive of at this time. For example, who could have predicted the occurrence of AIDS and the corresponding major impact on almost every element of society, including the fire service?

The tradition of the American fire service has been to accept these challenges and work on a dedicated, unselfish basis for their solution. This tradition will be continued as fire fighters meet future challenges using new and old techniques and resources.

Portions of this report were adapted from the document, "Feasibility Study of Fire Protection Cooperation in Santa Barbara County," prepared for the Santa Barbara County Firefighters - Local 2046, August 1987.

Appendix C.
Status Report on the 90 Recommendations from America Burning

Section I
Introduction

One of the major events of the United States fire service occurred in June 1973 — the publication of ***America Burning***. This document is the report of the National Commission on Fire Prevention and Control, a presidential commission appointed by President Richard M. Nixon. Richard E. Bland (associate professor, Pennsylvania State University) was commission chairman, and W. Howard McClennen (president of the International Association of Fire Fighters) was vice chairman. Commission members included members of Congress, the Secretaries of the Departments of Commerce and Housing and Urban development, and representatives of public and private organizations concerned with fire protection, including the fire service, insurance industry, news media, academia and the building industry.

The commission conducted research into the U.S. fire problem, held a series of hearings throughout the country and deliberated the solutions to these problems.

The result of this two-year effort was the commission's report, ***America Burning.***

This report contains 90 recommendations concerning the improvement of fire protection in the U.S. These recommendations cover the following general areas:

- burn prevention and treatment;
- fire fighter health and safety;
- building and fire codes and standards;
- automatic detection and suppression;
- fire protection master planning;
- fire department organization and operation;
- rural and wildland fire protection;
- public education;
- fire prevention inspection and enforcement;
- incentives for improved fire safety;
- transportation fire safety; and
- establishment of federal organizations for fire protection research, data collection and analysis, planning and training.

In the 15 years since ***America Burning*** was published, many of the recommendations have been accomplished,

and other recommendations have been accomplished partially. Some recommendations have been attempted without success, and others apparently have not been attempted at all.

The most visible accomplishment was the creation of the U.S. Fire administration, National Fire Academy and Center for Fire Research at the National Institute of Standards and Technology. However, some fire protection leaders have stated that this is only a partial success because the funding for these organizations has never come close to the amounts recommended by the commission.

Significant successes also have been achieved in such areas as installation of smoke detectors, improvement of fire and building codes, and fire protection master planning. Some success has been achieved for other recommendations, e.g., expanding public education programs and increasing fire department involvement in fire prevention. Other recommendations were not included in the legislation resulting from America Burning (P.L. 93-498) and, therefore, have not been implemented. For example, recommendations pertaining to fire department grants for training and equipment were not included in the legislation. Thus, such recommendations have not been accomplished at all.

The remainder of this report consists of the following sections:

Section II. Recommendation and Accomplishments - lists each of the 90 recommendations contained in America Burning along with a discussion of the extent to which each has been accomplished.

Section III. Summary of Accomplishments - contains a general discussion of (1) recommendations which have been substantially accomplished; (2) recommendations that have not been accomplished to any practical degree; and (3) recommendations for which significant progress has been made, but continued effort is still required.

Section II Recommendations and Accomplishments

2.1 Chapter 1 The Nation's Fire Problem

Recommendation

1.. The commission recommends that Congress establish a U.S. Fire Administration to provide a national focus for the nation's fire problem and to promote a comprehensive program with adequate funding to reduce life and property loss from fire.

Accomplishments

The United States Fire Administration (USFA) was established in 1975 as the National Fire Prevention and Control Administration. Also established were the National Fire Academy (NFA), originally a unit of the fire administration, and the Center for Fire Research (CFR), a unit of the National Institute of Standards and Technology. The commission recommended an average annual budget for the first five years of $125 million. However, the largest annual budget ever received was less than $24 million, including funding for the CFR.

Recommendation

2.. The commission recommends that a national fire data system be established to provide a continuing review and analysis of the entire fire problem.

Accomplishments

The National Fire Data Center (NFDC) was established in 1975 as a major component of the USFA. The National Fire Incident Reporting System (NFIRS) was implemented as the foundation of the NFDC, and now has 37 states and 20 metropolitan areas reporting data. Currently, the NFDC is conducting general data analysis, as well as special studies of fire fighter and residential fire facilities, and major and unusual fires. In addition, the NFDC is conducting a project to improve fire department long-range planning and tactical decisionmaking capabilities through automated management information systems.

2.2 Chapter 2 Living Victims of the Tragedy

Recommendation

3.. The commission recommends that Congress enact legislation to make possible the attainment of 25 burn units and centers and 90 burn programs within the next 10 years.

Accomplishments

Not included in legislation (P.L. 93-498), thus, there are no corresponding programs. However, by 1983, there were approximately 125 burn centers in the United States, including one in virtually every metropolitan area with a sufficient population base, a significant achievement. Such federal actions as the enactment of Medicare and Medicaid, and support of medical research and training have contributed to this progress.

Recommendation

4.. The commission recommends that Congress, in providing for new burn treatment facilities, make adequate provision for the training and continuing support of the specialists to staff these facilities. Provision also should be made for the special training of those who provide emergency care for burn victims in general hospitals.

Accomplishments

Not included in legislation (P.L. 93-498), thus, there are no corresponding programs. However, through other resources, this training is being carried out now on a broad scale by professional organizations and emergency medical service programs, and by burn centers throughout the nation.

Recommendation

5.. The commission recommends that the National Institutes of Health greatly augment their sponsorship of research on burns and burn treatment.

Accomplishments

In the mid-1970s, the National Institute of General Medical Sciences granted funds for burn research programs at seven burn center hospitals and other public and private grants supported research at other burn centers.

Recommendation

6.. The commission recommends that the National Institutes of Health administer and support a systematic program of research concerning smoke inhalation injuries.

Accomplishments

Not included in legislation (P.L. 93-498), thus, there are no corresponding programs. Also, see recommendation number 35.

2.3 Chapter 3 Are There Other Ways?

Recommendation

7.. The commission recommends that local governments make fire prevention at least equal to suppression in the planning of fire department priorities.

Accomplishments

In general, fire prevention efforts have increased dramatically, including expanded bureau and in-service company inspections and enforcement, improved public education programs, and increased involvement in land use planning and building/fire code development. The USFA, NFPA and other fire protection organizations have conducted numerous projects to promote and support the expansion of fire prevention activities by local departments. While these projects have helped to increase the amount of local government resources devoted to fire prevention, the goal of making "fire prevention at least equal to suppression" is yet to be reached, except in a few departments. For example, the Visalia (California) Fire Department currently devotes approximately 60% of its annual budget to prevention.

Recommendation

8.. The commission recommends that communities train and use women for fire service duties.

Accomplishments

The number of women in the fire service has increased significantly over the last 14 years. The first career woman fire fighter was hired by the Arlington County (Virginia) Fire Department in 1974 and is now a captain with that department. The USFA promoted the inclusion of women in the fire service and provided information to assist fire departments in recruiting and retaining women for fire fighting duties. This USFA program included the conduct of a conference on women in the fire service (1981), and preparation of the reports, Role of Women in the Fire Service, and Issues for Women in the Fire Service. The USFA is currently developing protective clothing and equipment sizing information for use by manufacturers in supplying items especially designed for female fire fighters.

Recommendation

9.. The commission recommends that laws which hamper cooperative arrangements among local fire jurisdictions be changed to remove the restrictions.

Accomplishments

There are no known statistics on the number of mutual (including automatic) aid agreements that have been implemented over the past 14 years, or revision of associated laws. However, the use of such agreements has been promoted by the USFA (through its Integrated Emergency Management System [IEMS] project, for example), and by conducting a fire service seminar on mutual aid. It is felt that the number and extent of use of mutual aid agreements have increased. The budget limitations experienced by local governments probably have contributed to this increase.

Recommendation

10.. The commission recommends that every local fire jurisdiction prepare a master plan designed to meet the community's present and future needs in fire protection, to serve as a basis for program budgeting, and to identify and implement the optimum cost-benefit solutions in fire protection.

Accomplishments

Numerous fire departments have prepared fire protection master plans as a result of the commission's recommendation and a comprehensive program conducted by the USFA. This program included the development of the master planning process (for both single and multi-jurisdictional planning), preparation of a set of manuals for use by departments in preparing plans, a national conference on master planning, a report to Congress on master planning, training courses and a planning support team. The number of departments that have prepared a master plan is unknown, but it is known that many plans have been prepared and some departments have updated their plans several times.

Recommendation

11.. The Commission recommends that federal grants for equipment and training be available only to those fire jurisdictions that operate from a federally approved master plan for fire protection.

Accomplishments

The legislation (PL 93-498) did not provide for grants for training and equipment.

Recommendation

12.. The commission recommends that the proposed U.S. Fire Administration act as a coordinator of studies of fire protection methods and assist local jurisdictions in adapting findings to their fire protection planning.

Accomplishments

The USFA has served as a clearinghouse for fire protection studies, ideas and information, and has disseminated such information through the Learning Resource Center and such publications as the arson and public education resource exchange bulletins.

2.4 Chapter 4 Planning for Fire Protection

Recommendation

13.. The commission recommends that the proposed U.S. Fire Administration provide grants to local fire jurisdictions for developing master plans for fire protection. Further, the proposed U.S. Fire Administration should provide technical advice and qualified personnel to local fire jurisdictions to help them develop master plans.

Accomplishments

The legislation (PL 93-498) did not provide for grants to fire departments for master planning. The USFA provided on-site master planning technical assistance during the period 1978-1982. This support was discontinued when the USFA was reorganized in 1983.

2.5 Chapter 5 Fire Service Personnel

Recommendation

14.. The commission recommends that the proposed U.S. Fire Administration sponsor research in the following areas: productivity measures of fire departments, job analyses, fire injuries and fire prevention efforts.

Accomplishments

Numerous projects were conducted within these areas, especially fire fighter safety and fire prevention. The major productivity projects included a fire department working relationships study and the analysis of alternative company staffing levels. The apparatus staffing study was not completed because of USFA budget limitations. Currently, the USFA is conducting a study of alternative methods of providing fire protection, with results being prepared for dissemination to state and local governments.

Recommendation

15.. The commission urges the federal research agencies, for example, the National Science Foundation and the National Institute of Standards and Technology, to sponsor research appropriate to their respective missions within the areas of productivity of fire departments, causes of fire fighter injuries, effectiveness of fire prevention efforts and the skills required to perform various fire department functions.

Accomplishments

The primary effort in these areas was accomplished by the USFA (see #14 above) because the missions of these agencies evolved into more technical issues. The USFA assumed responsibility for some of the fire projects initiated by NSF and NIST, for example, the pumping apparatus specifications and fire protection master planning projects. Projects conducted by the USFA in these areas resulted in the preparation of the following documents (as examples): Model Performance Criteria for Structural Fire Fighters' Helmets, Development of a Job-Related Physical Performance Examination for Fire Fighters - A Summary Report, Survey of Fire Fighter Injuries (in cooperation with IAFF), and National Fire Service System/ Task Analysis Phase I: Development of the Analysis Process. The USFA currently is sponsoring a fire fighter mortality study being conducted by the University of Washington.

Recommendation

16.. The commission recommends that the nation's fire departments recognize advanced and specialized education, and hire or promote persons with experience at levels commensurate with their skills.

Accomplishments

Many fire departments have recognized that specialized education and advanced degrees can be of benefit to the department, and have included such criteria in recruiting or promoting for specific positions.

Recommendation

17.. The commission recommends a program of federal financial assistance to local fire services to upgrade their training.

Accomplishments

The NFA currently provides financial assistance to local fire services through both resident and field training programs.

This assistance includes student stipends for resident classes, "train the trainer" (provides for training of state and local training personnel in the delivery of courses prepared for hand-off to state or local training organizations), direct supplementary delivery (supplements state and local training efforts), Academy Planning and Assistance Program (provides technical and training assistance to state and local fire service organizations), and Open Learning for the Fire Service (provides fire service personnel with the opportunity to earn baccalaureate degrees in fire administration or fire technology).

Recommendation

18.. In the administering of federal funds for training or other assistance to local fire departments, the commission recommends that eligibility be limited to those departments that have adopted an effective, affirmative action program related to the employment and promotion of members of minority groups.

Accomplishments

This recommendation has been accomplished through the Federal Procurement Regulations because these regulations have equal opportunity requirements applicable to grantees.

Recommendation

19.. The commission recommends that fire departments, lacking emergency ambulance, paramedical and rescue services, consider providing them, especially if they are located in communities where these services are not provided adequately by other agencies.

Accomplishments

Numerous fire departments have implemented and expanded EMS programs over the past 14 years. The USFA has conducted a number of activities to promote the establishment of fire service EMS programs, for example, the "National Workshop for Fire Service EMS Needs - the Rockville Report." In addition, the EMS standards established by DOT for personnel, vehicles and equipment have had a major impact on improving EMS programs at the local level. However, there are communities which still do not have adequate EMS programs.

2.6 Chapter 6 A National Fire Academy

Recommendation

20.. The commission recommends the establishment of a National Fire Academy to provide specialized training in areas important to the fire services and to assist state and local jurisdictions in their training programs. Accomplishments

The National Fire Academy has been operational since 1975 and has operated the fire training facility at Emmitsburg since January 1980. The academy has numerous programs to provide specialized training (hazardous materials, for example) and has provided assistance to local training activities, including course development and "train the trainer" courses.

Recommendation

21.. The commission recommends that the proposed National Fire Academy assume the role of developing, gathering and disseminating, to state and local arson investigators, information on arson incidents and on advanced methods of arson investigations.

Accomplishments

The NFA conducts arson investigation and related training. The USFA maintains an arson research and information dissemination effort, with the fire data center collecting and analyzing information on arson incidents. Currently, the USFA is developing a community-based organization anti-arson program, a juvenile firesetter program and an Arson Information Management System, and is disseminating the results of a study of the needs of the rural arson investigator. The previously published Arson Resource Directory is being updated, and the Arson Resource Center, located at the Learning Resource Center, is now computerized for rapid access and updating. The CFR compiled the information, edited and published a Fire Investigation Handbook that is in widespread use among arson investigators.

Recommendation

22.. The commission recommends that the National Fire Academy be organized as a division of the proposed U.S. Fire Administration which would assume responsibility for deciding details of the academy's structure and administration.

Accomplishments

During the period 1975-1981, the NFA was a component of the USFA. In 1981, the NFA was separated administratively from the USFA.

Recommendation

23.. The commission recommends that the full cost of operating the proposed National Fire Academy and subsidizing the attendance of fire service members be borne by the federal government.

Accomplishments

The NFA pays up to 75% of the cost of attending courses at the academy. Generally, the only cost to the attendee is a nominal payment for mealsand for local transportation at the departure location. This financial subsidy even includes airfare for attendees. However, continued subsidy is dependent on the availability of corresponding funds in the NFA budget.

2.7 Chapter 7 Equipping the Fire Fighter

Recommendation

24.. The commission urges the National Science Foundation, in its Experimental Research and Development Incentives Program, and the National Institute of Standards and Technology, in its Experimental Technology Incentives Program, to give high priority to the needs of the fire services.

Accomplishments

The National Science Foundation stopped its applied fire research activities upon establishment of the USFA and CFR. The NIST Experimental Technology Incentives Program did conduct a major project on methods for fire retarding polyester/cotton apparel fabrics before the ETIP program was stopped. The CFR program has included several projects in response to the needs of the fire services, for example, fire fighter turnout coats, helmets, lightweight air tanks and methodology for locating fire stations.

Recommendation

25.. The commission recommends that the proposed U.S. Fire Administration review current practices in terminology,

symbols and equipment descriptions, and seek to introduce standardization where it is lacking.

Accomplishments

The USFA, NFA and CFR have promoted several areas of standardization, including the National Fire Incident Reporting System, fire fighter protective clothing and equipment, the Incident Command System, terminology and through training courses at the NFA.

Recommendation

26.. The commission urges rapid implementation of a program to improve breathing apparatus systems and expansion of the program's scope where appropriate.

Accomplishments

Tremendous progress has been made in the design of safer, more effective breathing apparatus. In the early 1970s the NIST conducted a research and development project on the design of higher pressure, lighter weight air tanks. The USFA's Project FIRES, conducted in cooperation with the National Aeronautics and Space Administration (NASA), produced a new generation of breathing apparatus which is now widely available and used. The NFPA, under a USFA grant, prepared the Manual for Selection, Use, Care and Maintenance of Fire Fighter Self-Contained Breathing Apparatus. In addition, a USFA project with the Bureau of Mines addressed the design and testing of a (closed circuit) "Low Profile Rescue Breathing Apparatus." A prototype long-duration (two-hour), positive-pressure oxygen-breathing apparatus has been developed and is being field tested.

Recommendation

27.. The commission recommends that the proposed U.S. Fire Administration undertake a continuing study of fire service equipment needs, monitor research and development in progress, encourage needed research and development, disseminate results and provide grants to fire departments for equipment procurement to stimulate innovation in equipment design.

Accomplishments

To date, the USFA's equipment research and development activities have been focused on fire fighter protective equipment, smoke detectors and reporting systems, automatic detection and suppression systems, and specifying pumping apparatus. All of these activities have resulted in the improvement of equipment design and operation, as well as the dissemination of corresponding information. The USFA and NASA have developed and are testing a "hands-free" communications device which is fully compatible with self-contained breathing apparatus. The USFA legislation did not provide for grants for equipment procurement. A new portable monitor that will quickly detect and identify hazardous chemical vapors is being field tested by fire departments under USFA sponsorship. The USFA is cooperating with the U.S. Coast Guard in the lab testing of chemical protective clothing, and with the Coast Guard and the Department of Energy in evaluating a hazardous chemical protective ensemble.

Recommendation

28.. The commission urges the Joint Council of National Fire Service Organizations to sponsor a study to identify

shortcomings of fire fighting equipment and the kinds of research, development or technology transfer that can overcome the deficiencies.

Accomplishments

Members of the joint council have contributed to numerous USFA and NFA activities, especially as members of project advisory committees and the NFA Board of Visitors. However, the specified study was not conducted. The USFA did conduct a project to establish fire protection research and development priorities.

2.8 Chapter 8 No Recommendations

2.9 Chapter 9 The Hazards Created Through Materials

Recommendation

29.. The commission recommends that research in the basic processes of ignition and combustion be strongly increased to provide a foundation for developing improved test methods.

Accomplishments

The CFR conducts, both in-house and through a research grants program, fundamental and applied research in the physics and chemistry of fire leading to improved methods for measuring fire properties and fire performance of materials and products. The work ranges from flame chemistry and polymer degradation to the development of measurement and predictive methods. The fundamental research is used to underpin the more applied work. The research in flame chemistry is leading to the ability to predict the evolution of gases and particulates from the flame, e.g., soot and carbon monoxide. The work in polymer degradation is leading to the ability to design and produce more fire-safe materials. Measurement methods are being developed that will provide the scientifically based data needed as input to the predictive models.

Recommendation

30.. The commission recommends that the new Consumer Product Safety Commission (CPSC) give a high priority to the combustion hazards of materials in their end use.

Accomplishments

The CPSC, with technical backup from the CFR, has addressed the fire hazard of many consumer products by establishing mandatory standards, promoting voluntary standards, urging product recalls and providing consumer information. Included products are children's sleepwear, general apparel, mattresses, upholstered furniture, blankets, fire-safe cigarettes, cigarette lighters, matches, fireworks and heating equipment.

Recommendation

31.. The commission recommends that the present fuel load study sponsored by the General Services Administration and conducted by the National Institute of Standards and Technology be expanded to update the technical study of occupancy fire loads.

Accomplishments

The CFR conducted the fuel loads study for the GSA. The development by CFR of methods to predict the growth and spread of fire from measured fuel charac-

teristics indicates the need for new surveys to provide information for fire hazards and risk calculations.

Recommendation

32.. The commission recommends that flammability standards for fabrics be given high priority by the Consumer Product Safety Commission.

Accomplishments

The NIST and CPSC have implemented four flammable fabric standards, two which are mandatory and two which are voluntary in cooperation with manufacturers and trade associations. The children's sleepwear standard is mandatory. Prior to its adoption, there were approximately 60 child sleepwear-related fire deaths per year; now this number is approximately two deaths per year. A voluntary nightwear standard is being prepared in cooperation with industry. This standard will provide for point of sale comparative information on the flammability of various fibers. At the present time, approximately 75% of apparel fire deaths are persons over 65 years of age. This consumer information program should help to reduce that number. The Mattress Flammability Standard is mandatory and, as a result, almost every mattress being produced today will resist ignition by cigarette. The value of this standard is demonstrated by the fact that, during the period 1980 - 1984, there was an approximately 32% reduction in cigarette-ignited mattress fire deaths. In 1977, industry accepted a voluntary standard for upholstered furniture. Before this standard, approximately 10-15% of upholstered furniture would resist cigarette ignition; now approximately 68% will resist such ignition. During the period 1980 - 1984, cigarette-ignited upholstery fires decreased by approximately 24%.

Recommendation

33.. The commission recommends that all states adopt the Model State Fireworks Law of the National Fire Protection Association, thus prohibiting all fireworks except those for public displays.

Accomplishments

The NFPA, USFA and other organizations have promoted the adoption of this law, and many states have adopted this or similar laws.

Recommendation

34.. The commission recommends that the Department of Commerce be funded to provide grants for studies of the dynamics of combustion and the means of its control.

Accomplishments

The National Science Foundation RANN program on fire research was transferred to the CFR (a part of the National Institute of Standards and Technology which is an agency of the Department of Commerce) in the mid-1970s. CFR added funds from its base appropriation to increase the grants program to $2 million per year and annually funds more than 20 grants, mostly at universities. The CFR grants program is an integral part of the CFR program and is a way to bring the best scientific expertise in many disciplinary fields to focus on the fire problem. (See recommendation number 29 for a further description of the CFR program.)

Recommendation

35.. The commission recommends that the National Institute of Standards and Technology and the National Institutes of Health cooperatively devise and implement a set of research objectives designed to provide combustion standards for materials to protect human life.

Accomplishments

CFR has conducted a broad program of research into such fire problem areas as ignition, flame spread, products of combustion, extinguishment, detection and heat release. This program has led to the establishment or modification of many standards, mostly through the consensus standards-setting process, for example, the CPSC children's sleepwear, mattress and insulation standards; the flooring radiant panel test for floor coverings adopted by ASTM, NFPA and ISO; testing and installation standards for smoke detectors adopted by NFPA, UL and others; and the flame spread test for wall lining materials adopted by the International Maritime Organization. However, standards have not specifically been developed in cooperation with the National Institutes of Health.

2.10 Chapter 10 Hazards Through Design

Recommendation

36.. The commission urges the National Institute of Standards and Technology to assess current progress in fire research and define the areas in need of additional investigation. Further, the institute should recommend a program for translating research results into a systematic body of engineering principles and, ultimately, into guidelines useful to code writers and building designers.

Accomplishments

The CFR prepares both short- and long-term research plans based on an assessment of current and future needs of fire research results. In addition, CFR has established the National Fire Research Strategy Conference to prepare and continually update a fire research strategy for the nation. A major CFR thrust has been the translation of research results into a systematic body of engineering knowledge to provide guidelines, formulae, models, etc., to establish a soundly based fire protection engineering profession. Progress includes a set of engineering formulae known as FIREFORM, a prototype fire hazard assessment method called Hazard I, and several engineering models of varying sophistication that calculate fire growth and smoke spread.

Recommendation

37.. The commission recommends that the National Institute of Standards and Technology, in cooperation with the National Fire Protection Association and other appropriate organizations, support research to develop guidelines for a systems approach to fire safety in all types of buildings.

Accomplishments

The systems approach to building fire safety continues as a major project in the CFR. An important series of developments were the Fire Safety Evaluation Systems for various occupancies adopted in consensus standards and/or in various regulations. A more scientifically based system is currently in development.

Recommendation

38.. The commission recommends that, in all construction involving federal

money, awarding of those funds be contingent upon the approval of a fire safety systems analysis and a fire safety effectiveness statement.

Accomplishments

A "Study of Fire Safety Effectiveness Statements" was conducted by the USFA as part of this effort, with the conclusion that liability issues would preclude the practical application of this concept. The General Services Administration now uses the fire safety systems analysis concept in designing new federal buildings.

Recommendation

39.. The commission urges the Consumer Product Safety Commission to give high priority to matches, cigarettes, heating appliances and other consumer products that are significant sources of burn injuries, particularly products for which industry standards fail to give adequate protection.

Accomplishments

The CPSC, with technical support from the CFR, has addressed fire safety issues associated with matches, cigarettes, cigarette lighters and heating equipment, resulting in the adoption and use of mandatory requirements for matchbooks; the completion of a study of the technical and commercial feasibility of producing a cigarette that would not ignite material; the initiation of a cigarette lighter project which includes a study of how lighters start fires (approximately 200 people die each year from fires caused by lighters) and the consideration of lighter designs which are more difficult for use by children (i.e., "child proof"); and a study of electric, gas, kerosene and wood heaters to identify ways to improve design and maintenance. The CPSC has issued a regulation requiring labels on wood stoves which provides critical consumer information on installation, use and maintenance. (Approximately 20% of residential fires are caused by wood heating equipment.)

Recommendation

40.. The commission recommends to schools giving degrees in architecture and engineering that they include in their curricula at least one course in fire safety. Further, we urge the American Institute of Architects, professional engineering societies and state registration boards to implement this recommendation.

Accomplishments

The CFR has been instrumental in establishing courses in fire science and fire safety engineering at several small colleges and universities. The referenced organizations have not implemented the recommendation, however.

Recommendation

41.. The commission urges the Society of Fire Protection Engineers to draft model courses for architects and engineers in the field of fire protection engineering.

Accomplishments

The accomplishment in this area was achieved through a USFA grant to the Society of Fire Protection Engineers to prepare a methodology for fire-safe building design. The results of this project were documented in the report, Document the Final Fire Safety Methodology. Referenced model courses have yet to be developed.

Recommendation

42.. The commission recommends that the proposed National Fire Academy develop short courses to educate practicing designers in the basis of fire safety design.

Accomplishments

The NFA has developed and offers resident, hand-off and Open Learning courses in fire-safe building design.

2.11 Chapter 11 Codes and Standards

Recommendation

43.. The commission recommends that all local governmental units in the United States have in force an adequate building code and fire prevention code or adopt whichever they lack.

Accomplishments The USFA and NFA have promoted the adoption of building/fire codes and the strengthening of existing codes. While quantitative data is not available, it is known that many communities have adopted new codes or improved existing codes. For example, many communities have adopted automatic detection and suppression system, smoke detector, fireworks and/or noncombustible roof ordinances. The NFA offers resident and field courses that address code development. There are still many communities that do not have adequate codes, and some do not have codes of any kind.

Recommendation

44.. The commission recommends that local governments provide the competent personnel, training programs for inspectors and coordination among the various departments involved to enforce effectively the local building and fire prevention codes. Representatives from the fire department should participate in reviewing the fire safety aspects of plans for new building construction and alterations to old buildings.

Accomplishments

Building/fire code enforcement has improved significantly as fire departments have expanded their fire prevention programs (see Recommendation #7). Local and state governments (Florida, for example) have established training requirements for company and fire prevention bureau personnel who will be involved in inspection/enforcement activities. Relationships between fire and building departments have been enhanced in many communities, and, in some cases, the fire department has an inspector assigned to the building department. Furthermore, fire departments have become more involved in land use planning and review of proposed developments. The master planning program has helped in all of these areas because it stresses proactive fire protection activities. The USFA and NFA have promoted the improvement of inspection/enforcement capabilities through national conferences, manuals and training courses. The USFA recently has developed a new code implementation training program and has sponsored several related reports, including Management and Enforcement of Fire Codes, Administrative Aspects of Code Enforcement, and a four-volume set prepared by the American Bar Association, Alternatives for Effective Code Enforcement and Compliance Programs at the Local Level. The four volumes are for judges, prosecutors, local officials and code officials. To promote effective code enforcement, the USFA

sponsored numerous meetings for city managers, fire chiefs and state governors. The NFA offers several courses which cover inspection and plan review, including "Fire Prevention Specialists I and II," and "Plans Review for Inspectors."

Recommendation

45.. The commission recommends that, as the model code of the International Conference of Building Officials has already done, all model codes specify at least a single-station, early-warning detector oriented to protect sleeping areas in every dwelling unit. Further, the model codes should specify automatic fire extinguishing systems and early-warning detectors for high-rise buildings in which many people congregate.

Accomplishments

Significant advancement has been made in getting requirements for smoke detectors and automatic detection and suppression systems in codes. Currently, every major national model code requires smoke detectors in all new construction of dwelling units. In addition, some communities have amended these codes to require the retroactive installation of detectors in all dwelling units. The USFA and NFA have been extremely active in promoting the inclusion of requirements for detection and suppression systems in various codes. (The USFA provided significant input into the revision of the NFPA sprinkler standard [#13] and the development of the standard for residential sprinklers [#13D]). The USFA and CFR have conducted research into the effectiveness of such systems, held a number of conferences and workshops on these subjects, and prepared the National Directory of Automatic Suppression Systems and National Directory of Automatic Detection and Remote Alarm Systems, as well as numerous other reports which support the improvement of model codes in these areas. There are still many communities which do not have adequate codes for detection and suppression systems, especially for high-risk occupancies.

2.12 Chapter 12 Transportation Fire Hazards

Recommendation

46.. The commission recommends that the National Transportation Safety Board expand its efforts in issuance of reports on transportation accidents so that the information can be used to improve transportation fire safety.

Accomplishments

The NTSB currently performs this function, for example, smoke detectors are required now in the cabins of all commercial passenger aircraft.

Recommendation

47.. The commission recommends that the Department of Transportation work with interested parties to develop a marking system, to be adopted nationwide, for the purpose of identifying transportation hazards.

Accomplishments

The DOT placard system has been developed and implemented.

Recommendation

48.. The commission recommends that the proposed National Fire Academy disseminate to every fire jurisdiction appropriate educational materials on the

problems of transporting hazardous materials.

Accomplishments

The NFA offers on-campus courses in "Chemistry of Hazardous Materials" and "Hazardous Materials Tactical Considerations," and has developed hand-off hazardous materials training packages for use by state and local fire departments. However, there are still many fire service personnel (especially volunteers) who need, but have not received, such training. The NFA hazardous materials training program is expected to be expanded over the next three years as a result of the Superfund reauthorization legislation.

Recommendation

49.. The commission recommends the extension of the CHEMTREC system to provide ready access by all fire departments and to include hazard control tactics.

Accomplishments

The CHEMTREC system has been expanded to provide increased information and assistance to fire departments. There is now a need to provide hazardous materials information using terminology that can be understood easily by fire service personnel (i.e., plain english).

Recommendation

50.. The commission recommends that the Department of the Treasury establish adequate fire regulations, suitably enforced, for the transportation, storage and transfer of hazardous materials in international commerce.

Accomplishments

Regulations for the transportation, storage and transfer of hazardous materials, which would affect international commerce, have been implemented, but by the DOT and EPA rather than the treasury department.

Recommendation

51.. The commission recommends that the Department of Transportation set mandatory standards that will provide fire safety in private automobiles.

Accomplishments

The DOT established a burn rate test requirement for interior materials in automobiles. Most of the fire safety standards for automobiles arevoluntary.

Recommendation

52.. The commission recommends that airport authorities review their fire fighting capabilities and, where necessary, formulate appropriate capital improvement budgets to meet current recommended aircraft rescue and fire fighting practices.

Accomplishments

The intent of this recommendation has been accomplished by the DOT.

Recommendation

53.. The commission recommends that the Department of Transportation undertake a detailed review of the Coast Guard's responsibilities, authority and standards relating to marine fire safety.

Accomplishments

This is an on-going Coast Guard effort.

Recommendation

54.. The commission recommends that the railroads begin a concerted effort to reduce rail-caused fires along the nation's rail system.

Accomplishments

Progress has been made in this area through the use of hot-box detectors and spark arresters.

Recommendation

55.. The commission recommends that the Urban Mass Transportation Administration require explicit fire safety plans as a condition for all grants for rapid transit systems.

Accomplishments

Grants for rapid transit systems now include fire safety plan requirements.

2.13 Chapter 13 Rural Fire Protection

Recommendation

56.. The commission recommends that rural dwellers and others living at a distance from fire departments install early-warning detectors and alarms to protect sleeping areas.

Accomplishments

The USFA and other fire organizations have conducted extensive public education programs to encourage the use of detection and warning systems in rural areas.

Recommendation

57.. The commission recommends that U.S. Department of Agriculture assistance to community fire protection facilities projects be contingent upon an approved master plan for fire protection for local jurisdictions. Accomplishments

This recommendation has not been implemented by the Department of Agriculture. However, the USFA has developed and promoted a master planning process designed especially for small towns and rural areas, the Basic Guide for Fire Prevention and Control Master Planning.

2.14 Chapter 14 Forest and Grassland Fire Protection

Recommendation

58.. The commission recommends that the proposed U.S. Fire Administration join with the U.S. Forest Service in exploring means to make fire safety education for forest and grassland protection more effective.

Accomplishments

The USFA has been working with the U.S. Forest Service since 1975, and an active program is underway. Furthermore, the USFA is a member of the National Wildfire Coordinating Group.

Recommendation

59.. The commission recommends that the Council of State Governments should develop model state laws relating to fire protection in forests and grasslands.

Accomplishments

This recommendation has not been initiated.

Recommendation

60.. The commission urges interested citizens and conservation groups to examine fire laws in their respective states and to press for strict compliance.

Accomplishments

Individuals and organizations have been performing this function (lobbying for fire-safe roofing laws, for example). However, these efforts have not been coordinated at the national level.

Recommendation

61.. The commission recommends that the U.S. Forest Service develop the methodology to make possible nationwide forecasting of fuel build-up as a guide to priorities in wildland management.

Accomplishments

The USFS has an active fuel management program in progress which includes pre-deployment of resources as a function of fuel loading, weather and other factors.

Recommendation

62.. The commission supports the development of a National Fire Weather Service in the National Oceanic and Atmospheric Administration and urges its acceleration.

Accomplishments

This recommendation has been accomplished; the National Fire Weather Service is operational.

2.15 Chapter 15 Fire Safety Education

Recommendation

63.. The commission recommends that the Department of Health, Education and Welfare (now the Department of Health and Human Services) include in accreditation standards fire safety education in the schools throughout the school year. Only schools presenting an effective fire safety education program should be eligible for any federal financial assistance.

Accomplishments

Some states and local school districts have adopted requirements for fire safety education. However, it is not known if the Department of Education has established accreditation standards.

Recommendation

64.. The commission recommends that the proposed U.S. Fire Administration sponsor fire safety education courses for educators to provide a teaching cadre for fire safety education.

Accomplishments

The USFA has actively promoted fire safety education through conferences and preparation of manuals and materials. For example, the USFA prepared the Public Fire Education Planning Manual, and the report, Young Children as New Targets for Public Fire Education. The NFA conducts training courses to help in working with educators and the school system, for example, "Introduction to Fire Safety Education" and "Advanced Fire Safety Education."

Recommendation

65.. The commission recommends to the states the inclusion of fire safety education in programs for future teachers and the requirement of fire safety knowledge as a prerequisite for teaching certification.

Accomplishments

The degree to which states have implemented this recommendation is unknown, which probably means that little has been accomplished.

Recommendation

66.. The commission recommends that the proposed U.S. Fire Administration develop a program, with adequate funding, to assist, augment, and evaluate existing public and private fire safety education efforts.

Accomplishments

Since 1975, the USFA has conducted a program to support local public education activities. The extent of this program has varied according to the extent of funding available each fiscal year. This program has included the general promotion of public education efforts by local agencies through meetings (e.g., the "Public Fire Education Planning Conference"); preparation of support materials (e.g., Media Ideas Workbook); and provision of limited financial support through the "Public Education Assistance Program" (PEAP) which was offered during the period 1979-1981 and had to be discontinued as a result of funding reductions. The USFA is sponsoring the Community Volunteer Fire Prevention Program to promote the cooperation of local fire departments and citizen groups in conducting community fire prevention, education and protection programs.

Recommendation

67.. The commission recommends that the proposed U.S. Fire Administration, in conjunction with the National Advertising Council and National Fire Protection Association, sponsor an all-media campaign of public service advertising designed to promote public awareness of fire safety.

Accomplishments

The USFA has conducted a number of national campaigns (e.g., the national smoke detector installation and maintenance campaign). In fiscal year 1985, a renewed public education and awareness effort was initiated as a result of additional Congressional support. An all-media campaign conducted in conjunction with the National Advertising Council has not been accomplished. However, such a program still is being pursued.

Recommendation

68.. The commission recommends that the proposed U.S. Fire Administration develop packets of educational materials appropriate to each occupational category that has special needs or opportunities in promoting fire safety.

Accomplishments

Although packets have not been developed for specific occupations, materials for pre-school children and teachers were developed in cooperation with the Children's Television Workshop (i.e., "Sesame Street"). The award winning Sesame Street Fire Safety Program is being expanded to include older children.

2.16 Chapter 16 Fire Safety for the Home

Recommendation

69.. The commission supports the Operation EDITH (Exit Drills In The Home) plan and recommends its acceptance and implementation both individually and communitywide.

Accomplishments

The NFPA has made a significant effort in accomplishing this recommendation. The EDITH program is accepted and used widely by local fire service and community groups.

Recommendation

70.. The commission recommends that annual home inspections be undertaken by every fire department in the nation. Further, federal financial assistance to fire jurisdictions should be contingent upon their implementation of effective home fire inspection programs.

Accomplishments

Home fire inspection programs of various types are conducted by most fire departments. The USFA has encouraged the initiation of such programs through research (e.g., Project RIDFIRE and the Municipal Fire Insurance Analysis): conferences (e.g., "Dynamics of Fire Prevention"); and preparation of materials (e.g., the Edmonds [Washington] Home Survey materials). Because of the constitutional issue of eminent domain, a more direct federal role is not considered appropriate.

Recommendation

71.. The commission urges Americans to protect themselves and their families by installing approved early-warning fire detectors and alarms in their homes.

Accomplishments

As a result of vigorous programs involving the USFA, other federal agencies, national fire service organizations, and state and local fire protection agencies, smoke detectors are now in an estimated 80% of dwelling units nationwide. There is now a need for programs to ensure that these detectors are tested and maintained properly.

Recommendation

72.. The commission recommends that the insurance industry develop incentives for policyholders to install approved early-warning fire detectors in their residences.

Accomplishments

Many residential fire insurance policies now offer discounts for use of smoke detectors and residential sprinkler systems.

Recommendation

73.. The commission urges Congress to consider amending the Internal Revenue Code to permit reasonable deductions from income tax for the cost of installing approved detection and alarm systems in homes.

Accomplishments

The USFA actively pursued this recommendation. However, the IRS did not feel that the income tax could be used as a fire safety incentive. Furthermore, a sponsor was not identified for the necessary legislation. However, in a related area, California adopted a constitutional amendment excluding the value of newly

installed automatic detection and suppression systems in establishing property value for taxing purposes.

Recommendation

74.. The commission recommends that the proposed U.S. Fire Administration monitor the progress of research and development on early-warning detection systems in both industry and government and provide additional support for research and development where needed.

Accomplishments

The USFA and CFR have been involved extensively in smoke detector research and development. Examples of corresponding publications include New Concepts of Fire Detection, Analysis of Fire Detector Test Methods/Performance, and Detector Sensitivity and Siting Requirements for Dwellings. The CFR is studying the detector false alarm problem in hospitals.

Recommendation

75.. The commission recommends that the proposed U.S. Fire Administration support the development of the necessary technology for improved automatic extinguishing systems that would find ready acceptance by Americans in all kinds of dwelling units.

Accomplishments

As a result of USFA activities, significant progress has been made in the development and installation of residential sprinkler systems. These activities have included support of system design (e.g., Development of Low-Cost Residential Sprinkler Protection: A Technical Report, Study to Establish the Existing Automatic Fire Suppression Technology for Use in Residential Occupancies, and Sprinkler Performance in Residential Fire Tests). In addition, the USFA was a sponsor of "Operation San Francisco" which was a series of tests of retrofitted sprinkler systems (including a residential occupancy) using advanced designs and materials. The USFA also has been active in sponsoring a number of meetings to disseminate the results of these efforts and encourage the implementation of such systems. For example, the USFA currently is sponsoring a nationwide series of sprinkler workshops in cooperation with the International Association of Fire Chiefs.

Recommendation

76.. The commission recommends that the National Fire Protection Association and American National Standards Institute jointly review the Standard for Mobile Homes and seek to strengthen it, particularly in such areas as interior finish materials and fire detection.

Accomplishments

The CFR, after considerable research, recommended guidelines for fire safety to HUD, directed primarily at interior finish, for the agency's minimum property standards for mobile homes. These guidelines were adopted and implemented.

Recommendation

77.. The commission recommends that all political jurisdictions require compliance with the NFPA/ANSI standard for mobile homes, together with additional requirements for early-warning fire detectors and improved fire resistance of materials.

Accomplishments

As a result of NFPA activities, mobile home standards now require the installation of smoke detectors in new mobile homes, as well as exiting requirements and interior flame spread restrictions.

Recommendation

78.. The commission recommends that state and local jurisdictions adopt the NFPA Standard on Mobile Home Parks as a minimum mode of protection for the residents of these parks.

Accomplishments

Many jurisdictions have adopted the NFPA standard.

2.17 Chapter 17 Fire Safety for the Young, Old and Infirm

Recommendation

79.. The commission strongly endorses the provisions of the Life Safety Code which require specific construction features, exit facilities and fire detection systems in child day care centers, and recommends that they be adopted and enforced immediately by all the states as a minimum requirement for the licensing of such facilities.

Accomplishments

Many states and communities have adopted NFPA's Life Safety Code.

Recommendation

80.. The commission recommends that early-warning detectors and total automatic sprinkler protection or other suitable automatic extinguishing systems be required in all facilities for the care and housing of the elderly.

Accomplishments

All national codes and state statutes now require such protection for congregate care facilities.

Recommendation

81.. The commission recommends to federal agencies and the states that they establish mechanisms for annual review and rapid upgrading of their fire safety requirements for facilities for the aged and infirm to a level no less stringent than the current NFPA Life Safety Code.

Accomplishments

The code development process provides for the accomplishment of this recommendation.

Recommendation

82.. The commission recommends that the special needs of the physically handicapped and elderly in institutions, special housing and public buildings be incorporated into all fire safety standards and codes.

Accomplishments

This recommendation must be accomplished by standard-setting and code organizations. The USFA has analyzed these problems (e.g., Fire and Life Safety for the Handicapped) and has encouraged improvement of standards and codes and adoption by state and local governments. The NFPA has addressed the special needs of congregate care facilities in the Life Safety Code (101). If federal funds are involved, such facilities must meet the codes and standards.

Recommendation

83.. The commission recommends that the states provide for periodic inspection of facilities for the aged and infirm, either by the state fire marshal's office or by local fire departments, and also require approval of plans for new facilities and inspection by a designated authority during and after construction.

Accomplishments

Many states and local jurisdictions now have such requirements. The USFA has encouraged the adoption of these requirements.

Recommendation

84.. The commission recommends that the National Institute of Standards and Technology develop standards for the flammability of fabric materials commonly used in nursing homes, with a view to providing the highest level of fire resistance compatible with the state-of-the-art and reasonable costs.

Accomplishments

The CPSC, with technical support from CFR, has established several standards under the Flammable Fabrics Act that are also applicable to the needs of nursing homes. In addition, CFR developed the Fire Safety Evaluation System for health care facilities that aids in the objective fire safety evaluation of such facilities by both the fire service and owner/operators.

Recommendation

85.. The commission recommends that political subdivisions regulate the location of nursing homes and housing for the elderly and require that fire alarm systems be tied directly and automatically to the local fire department.

Accomplishments

This recommendation would be implemented through local zoning regulations and codes. Many communities now require central station monitoring of automatic detection and suppression systems in these occupancies.

3.18 Chapter 18 Research for Tomorrow's Fire Problem

Recommendation

86.. The commission recommends that the federal government retain and strengthen its programs of fire research for which no non-governmental alternatives exist.

Accomplishments

Fire research programs have been conducted by the USFA and CFR, but not to the extent envisioned in America Burning because of budget limitations. For example, the commission recommended an annual research budget (USFA and CFR) of $33,250,000 (1973 dollars). The largest budget ever given to the USFA for all programs was approximately $24 million.

Recommendation

87.. The commission recommends that the federal budget for research connected with fire be increased by $26 million.

Accomplishments

See recommendation 86.

Recommendation

88.. The commission recommends that associations of material and product manufacturers encourage their member

companies to sponsor research directed toward improving the fire safety of the built environment.

Accomplishments

Associations and manufacturers have increased fire research activities, for example, the Chemical Manufacturers Association, The Society of the Plastics Industry, Carpet and Rug Institute, Tobacco Institute, and Concrete and Masonry Institute. These associations also have sponsored research at such private laboratories as the Southwest Research Institute, Factory Mutual and Underwriters Laboratories.

2.19 Chapter 19 Federal Involvement

Recommendation

89.. The commission recommends that the proposed U.S. Fire Administration be located in the Department of Housing and Urban Development.

Accomplishments

Originally, the USFA was in the Department of Commerce and was moved to the Federal Emergency Management Agency in 1979.

Recommendation

90.. The commission recommends that federal assistance in support of state and local fire service programs be limited to those jurisdictions complying with the National Fire Data System reporting requirements.

Accomplishments

The federal assistance funding categories included in the commission's proposed budget were not included in subsequent U.S. Forest Service funding. Therefore, this recommendation is not applicable.

Section III
Summary of Accomplishments

The recommendations which have been fully or substantially accomplished generally have been associated with the agencies created as a result of America Burning or those with a public safety mission such as the Consumer Product Safety Commission.

Conversely, those recommendations not accomplished were generally the responsibility of agencies not primarily concerned with fire safety, for example, the U.S. Department of Agriculture, Department of Education and the Council of State Governments.

3.1 Recommendations Generally Accomplished

The recommendations that are fully or practically accomplished are listed below:

1.. The commission recommends that Congress establish a U.S. Fire Administration to provide a national focus for the nation's fire problem and to promote a comprehensive program with adequate funding to reduce life and property loss from fire. (Note; The USFA was established, but never funded at the recommended levels.)

18.. In the administering of federal funds for training or other assistance to local fire departments, the commission recommends that eligibility be limited to

those departments that have adopted an effective affirmative action program related to the employment and promotion of members of minority groups.

20.. The commission recommends the establishment of a National Fire Academy to provide specialized training in areas important to the fire services and to assist state and local jurisdictions in their training programs. (Note: The NFA was established, but never funded at the recommended levels.)

42.. The commission recommends that the proposed National Fire Academy develop short courses to educate practicing designers in the basis of fire safety design.

45.. The commission recommends that, as the model code of the International Conference of Building Officials has already done, all model codes specify at least a single-station early-warning detector oriented to protect sleeping areas in every dwelling unit. Further, the model codes should specify automatic fire extinguishing systems and early-warning detectors for high-rise buildings in which many people congregate.

46.. The commission recommends that the National Transportation Safety Board expand its efforts in issuance of reports on transportation accidents so that the information can be used to improve transportation fire safety.

47.. The commission recommends that the Department of Transportation work with interested parties to develop a marking system, to be adopted nationwide, for the purpose of identifying transportation hazards.

49.. The commission recommends the extension of the CHEMTREC system to provide ready access by all fire departments and to include hazard control tactics.

50.. The commission recommends that the Department of the Treasury establish adequate fire regulations, suitably enforced, for the transportation, storage and transfer of hazardous materials in international commerce.

52.. The commission recommends that airport authorities review their fire fighting capabilities and, where necessary, formulate appropriate capital improvement budgets to meet current recommended aircraft rescue and fire fighting practices.

55.. The commission recommends that the Urban Mass Transportation Administration require explicit fire safety plans as a condition for all grants for rapid transit systems.

62.. The commission supports the development of a National Fire Weather Service in the National Oceanic and Atmospheric Administration and urges its acceleration.

77.. The commission recommends that all political jurisdictions requirecompliance with the NFPA/ANSI standard for mobile homes, together with additional requirements for early-warning fire detectors and improved fire resistance of materials.

80.. The commission recommends that early-warning detectors and total automatic sprinkler protection or other suitable automatic extinguishing systems be required in all facilities for the care and housing of the elderly.

81.. The commission recommends to federal agencies and the states that they

establish mechanisms for annual review and rapid upgrading of their fire safety requirements for facilities for the aged and infirm to a level no less stringent than the current NFPA Life Safety Code.

3.2 Recommendations Not Accomplished

The recommendations without any significant accomplishments are listed below:

6.. The commission recommends that the National Institutes of Health administer and support a systematic program of research concerning smoke inhalation injuries.

11.. The commission recommends that federal grants for equipment and training be available only to those fire jurisdictions that operate from a federally approved master plan for fire protection.

28.. The commission urges the Joint Council of National Fire Service Organizations to sponsor a study to identify shortcomings of fire fighting equipment and the kinds of research, development or technology transfer that can overcome the deficiencies.

40.. The commission recommends to schools giving degrees in architecture and engineering that they include in their curricula at least one course in fire safety. Further, we urge the American Institute of Architects, professional engineering societies and state registration boards to implement this recommendation.

41.. The commission urges the Society of Fire Protection Engineers to draft model courses for architects and engineers in the field of fire protection engineering.

57.. The commission recommends that U.S. Department of Agriculture assistance to community fire protection facilities projects be contingent upon an approved master plan for fire protection for local jurisdictions.

59.. The commission recommends that the Council of State Governments undertake to develop model state laws relating to fire protection in forests and grasslands.

73.. The commission urges Congress to consider amending the Internal Revenue Code to permit reasonable deductions from income tax for the cost of installing approved detection and alarm systems in homes.

87.. The commission recommends that the federal budget for research connected with fire be increased by $26 million.

89.. The commission recommends that the proposed U.S. Fire Administration be located in the Department of Housing and Urban Development.

90.. The commission recommends that federal assistance in support of state and local fire service programs be limited to those jurisdictions complying with the National Fire Data System reporting requirements.

3.3 Recommendations Partially Accomplished

All of the remaining recommendations fall into this category. Each recommendation has been accomplished to some degree, but additional effort is required. In some cases, the recommendation may never be accomplished fully because it is on-going and general in nature.

In many cases, recommendations could not be completed because of a lack of resources, especially considering that the USFA, NFA and CFR were never funded at anywhere near the levels recommended by the commission.

3.4 Conclusions

The accomplishments discussed in this report are truly significant. In fact, 79 of the 90 recommendations have been accomplished to some degree, and the consequences of these accomplishments have had a major impact on the protection of life and property. For example:

- The annual number of fire deaths has decreased by 23% from 1975 to 1985 (an average annual reduction of 1900 deaths). On a cumulative basis, this reduction means that an estimated 6,900 lives have been saved between 1975 and 1985. Fire fighter deaths also have been reduced significantly.
- Even greater reductions in fire deaths have been achieved within special categories. Clothing fire deaths have fallen by 73% over the period 1968-1983. In addition, children's clothing fire deaths have dropped by 90%.
- The number of fires reported to fire departments has decreased by approximately 20% over the period 1975-1985. The number of reported fires has been decreasing even though the population is increasing which means that the number of fires is declining even on a per capita basis.

These achievements demonstrate what has been accomplished since America Burning was published, and the potential for what could be accomplished if the remaining recommendations were substantially completed.

Appendix C
Fire in the United States

(The 11th edition was just being released as this course was in active distribution.)

tenth edition

FIRE IN THE UNITED STATES

1986–1995

National Fire Center ▪ United States Fire Administration
Federal Emergency Management Agency

EXECUTIVE SUMMARY

Fire kills thousands of Americans each year, injures tens of thousands, destroys billions of dollars in property, and costs tens of billions of dollars overall, but mayors and city managers, school officials, the media, and the general public still are largely unaware of the magnitude of these numbers. Their lack of awareness and failure to realize the seriousness of fire to communities and the country are factors that keep the U.S. fire problem one of the worst in the world per capita.

PURPOSE AND SCOPE

This report is designed to arm the fire service and others with a statistical overview of the fire problem that can motivate corrective action. It can also be used to select priorities and help target fire programs, serve as a model for state or local analyses of fire data, and provide a baseline for evaluating programs.

This Tenth Edition of *Fire in the United States* covers the 10-year period from 1986 to 1995, with emphasis on 1995—the most recent year for which complete data are available at the time of preparation. The primary source of data in this report is the National Fire Incident Reporting System (NFIRS), but National Fire Protection Association (NFPA) annual survey results and data from the various state agencies responsible for state fire information are also used.

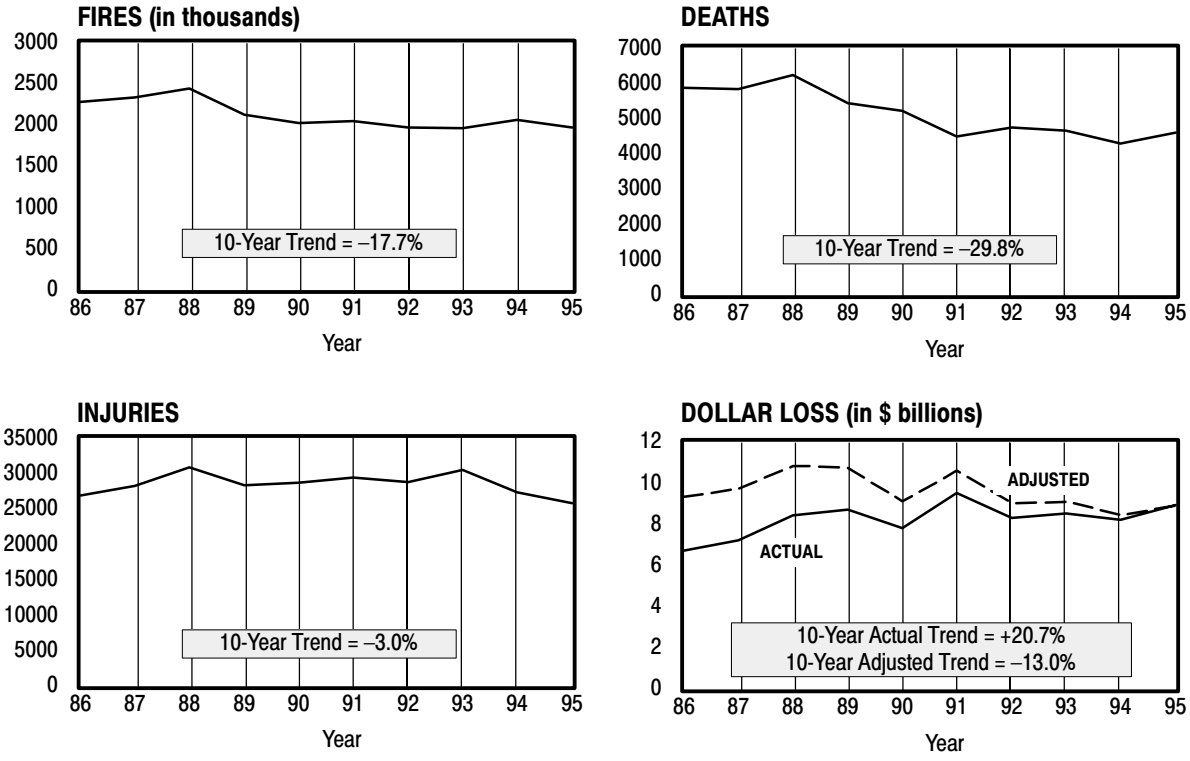
Because of the time it takes to collect data from the more than 13,000 fire departments that participate in NFIRS, edit and obtain corrections, and analyze and display the results, the date of publication lags the date of collection.

This edition of *Fire in the United States* includes a state-by-state analysis and presentation of state-based residential fire statistics. This information is more exhaustive than similar information presented in the past—each state has provided additional information on innovative and successful programs that have positively affected the state's individual fire problem. And, where available, the associated Web site address for the state fire agency has been provided. Previous editions of *Fire in the United States* have included two chapters that detail the residential and nonresidential structure fire problem. Due to the size of the state chapter, these two chapters have been omitted from this edition. The Eleventh Edition of *Fire in the United States* will again address these two key areas of the U.S. fire problem.

As in every edition of *Fire in the United States*, a chapter is provided that focuses on deaths and injuries to firefighters.

THE NATIONAL FIRE PROBLEM

Figure 1 summarizes the national fire problem.[1] During the 10-year period 1986–1995, there was an average of 5,117 civilian fire deaths, 28,400 civilian injuries, 56,260 fireground firefighter injuries, and $9.6 billion dollar loss (adjusted to 1995 dollars) from reported fires each year. The United States averaged 2.1 million reported fires annually during this period.



Sources: NFPA Annual Surveys and Consumer Price Index

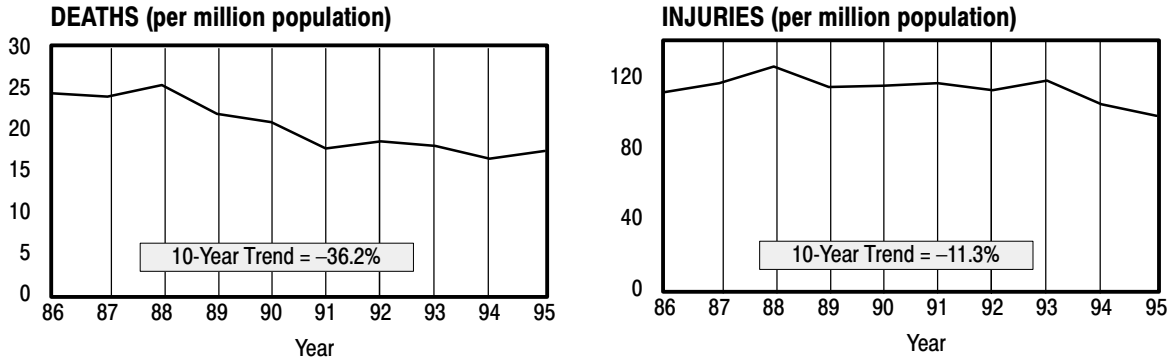
Figure 1. Trends in Fires and Fire Losses

Over the past 10 years, the number of fires reported to the fire service has decreased 18 percent,[2] with a noticeable drop in 1989 and remaining relatively steady since then. Civilian deaths from fire dropped sharply over this period (30 percent). Civilian injuries remained steady over 10 years. The magnitude or trend of injuries from unreported fires is not known. When adjusted for inflation (1995 dollars), losses were down a significant 13 percent over the period.

On a per capita basis, the fire problem is less severe in 1995 than it was 10 years earlier because the population increased faster than did fires and fire casualties (Figure 2). The per capita fire death trend was down 36 percent, and the per capita injury trend was down 11 percent. Although the death rate per fire in the United States has

[1] See page NO TAG for a discussion of how trend percentages were calculated.

[2] The percentages discussed throughout this chapter have been adjusted to apportion the "unknowns" across the other categories.



Sources: NFPA Annual Surveys, Consumer Price Index, and Bureau of the Census

Figure 2. Trends in Severity of Casualties

improved greatly, it remains much higher than the yearly reported fire death rates in countries such as Australia, Japan, Hong Kong, and most of the countries in Western Europe.

Regional Variations

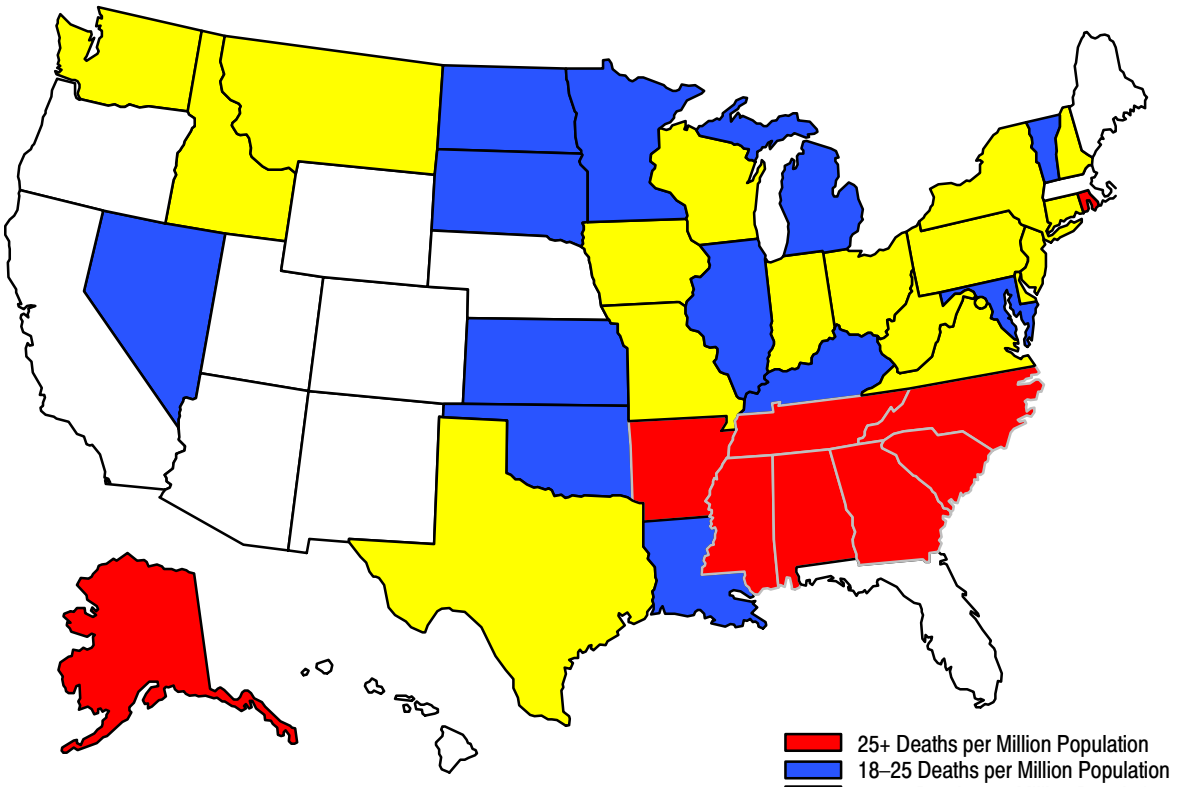
The fire problem varies from region to region and state to state because of variations in climate, poverty, education, demographics, and other factors. The Figure 3 map shows that the fire death rate per capita is highest in the Southeast and a few isolated states. The Southeast and Alaska have been consistently among the highest fire death rate states for many years. The highest death rates in 1995 were in Mississippi, Alabama, Alaska, and Arkansas. States with the lowest fire death rates were Utah, New Mexico, California, and Hawaii; these same states ranked low in 1994.

Another important measure to examine is the absolute number of fire deaths in each state. The 11 states with the most fire deaths account by themselves for nearly half of the national total. As expected, large-population states are at the top of this list. National totals cannot be reduced significantly unless these states reduce their fire problem.

Even though the death rate varies, the leading causes of fires (cooking, heating, and arson) and fire deaths (careless smoking, arson, and heating) are relatively similar around the nation. The rank order and magnitude of these causes vary from state to state and by whether fires, deaths, or injuries are used as the measure. Therefore, the priorities for prevention programs must be tailored to location and purpose.

Where Fire Losses Occur

Although most fires occur outside, the public generally does not appreciate the magnitude of the fire problem in the home nor the importance of doing its share to reduce fires in the home. Based on 1995 data, the vast majority of our civilian fire



Note: 1995 data from Indiana and Nevada are incomplete. 1994 data are shown.

Sources: State Fire Marshals and the United States Fire Administration

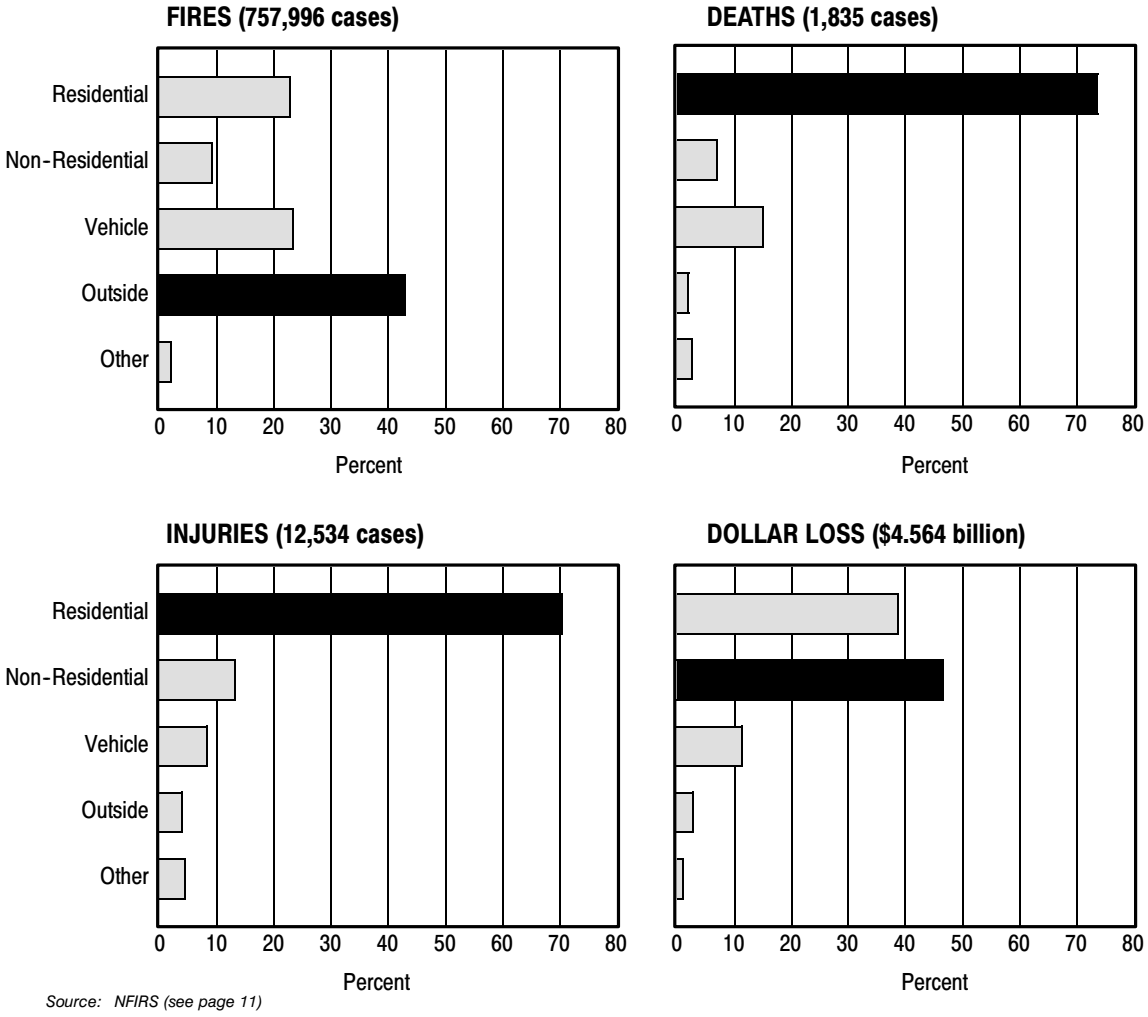
Figure 3. Fire Death Rate by State in 1995

deaths (74 percent) and injuries (70 percent) continue to occur in residences, although residences have only 23 percent of the total fires (Figure 4). More than two-thirds of injuries incurred by firefighters are in residences. And residences account for a substantial portion of the dollar loss, 47 percent. The 10-year trend mirrors the 1995 picture.

Non-residential properties include industrial and commercial properties, institutions, educational establishments, vacant and under construction properties, and mobile properties. Fire prevention efforts have focused on protecting non-residential structures, and the results have been successful to a large degree. These structures account for 9 percent of all fires, 7 percent of fire deaths, and 13 percent of injuries. Because non-residential structures tend to have very large dollar values, the 9 percent of total fires equates to 47 percent of the total dollar loss.

As in 1994, about one in four fires attended by the fire service involves vehicles, mainly cars and trucks. In 1995, the fire service responded to more vehicle fires than to residential fires. And this does not include the tens of thousands of fire department responses to vehicle accidents in which there was no fire.

In 1995, vehicles accounted for the second largest percentage of fire deaths reported to NFIRS, 15 percent, and they accounted for 8 percent of the injuries and



Source: NFIRS (see page 11)

Figure 4. 1995 Fires and Fire Losses by General Property Type

11 percent of the reported dollar loss. The exact number of vehicle fire deaths is uncertain because of the difficulty in determining whether the impact of the accident or the subsequent fire was the cause of death in many cases. The 10-year trend in vehicle casualties has decreased steadily, perhaps due to better safety features that are being built into automobiles. However, there is no doubt that vehicles comprise a much larger segment of the fire problem than most people realize.

More fires occur outside (e.g., fields, vacant lots, wildland) than any of the other major property types. Although this category of property accounts for the highest number of fires, it represents the least amount of deaths (2 percent), injuries (4 percent), and dollar loss (3 percent). Many of the fires to which fire departments respond are intentionally set but result in relatively little damage. Outside fires, however, are cause for concern because they may spread to structures. In 1995, outside fires (fires outside of structures other than vehicles) represented 43 percent of all fires (about the same as in 1994). The 800,000 to 1 million outside fires to which fire departments respond represent a significant burden to the fire service. These numbers may not reflect the true nature of the problem because of underreporting, the difficulty in

setting a price tag on outside fires, and the fact that many wildland fires are not reported to NFIRS or the NFPA annual survey.

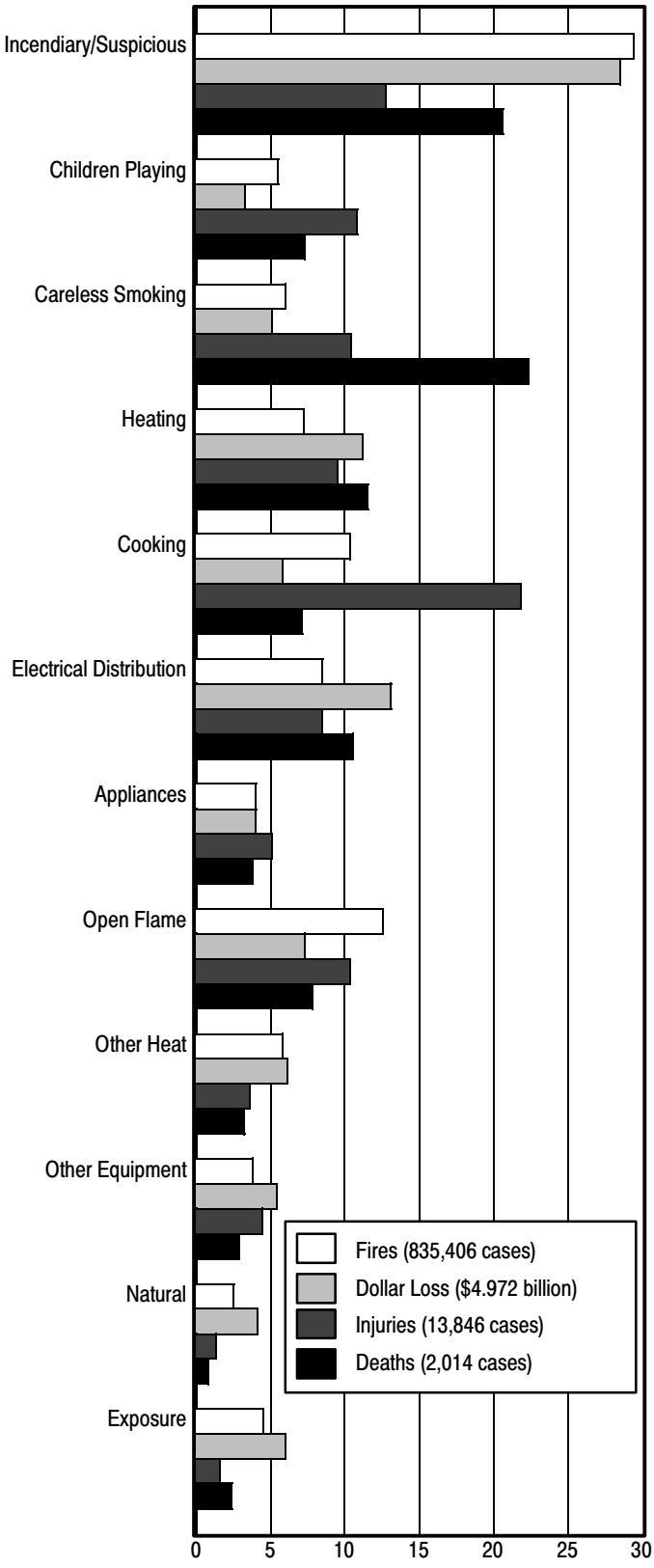
Causes of Fires and Fire Losses

When all fires from all the different occupancies are combined, arson is by far the leading cause of fire and direct dollar loss, accounting for nearly 30 percent of both fires and dollar loss (Figure 5). The leading cause of all fire deaths is careless smoking (22 percent), followed closely by arson (21 percent). The leading cause of injuries is cooking (22 percent) with arson second (13 percent). Since most fire deaths and fire injuries occur in the home, the overall leading causes of deaths and injuries are dominated by causes most closely associated with residential properties.

Who Dies or Gets Injured

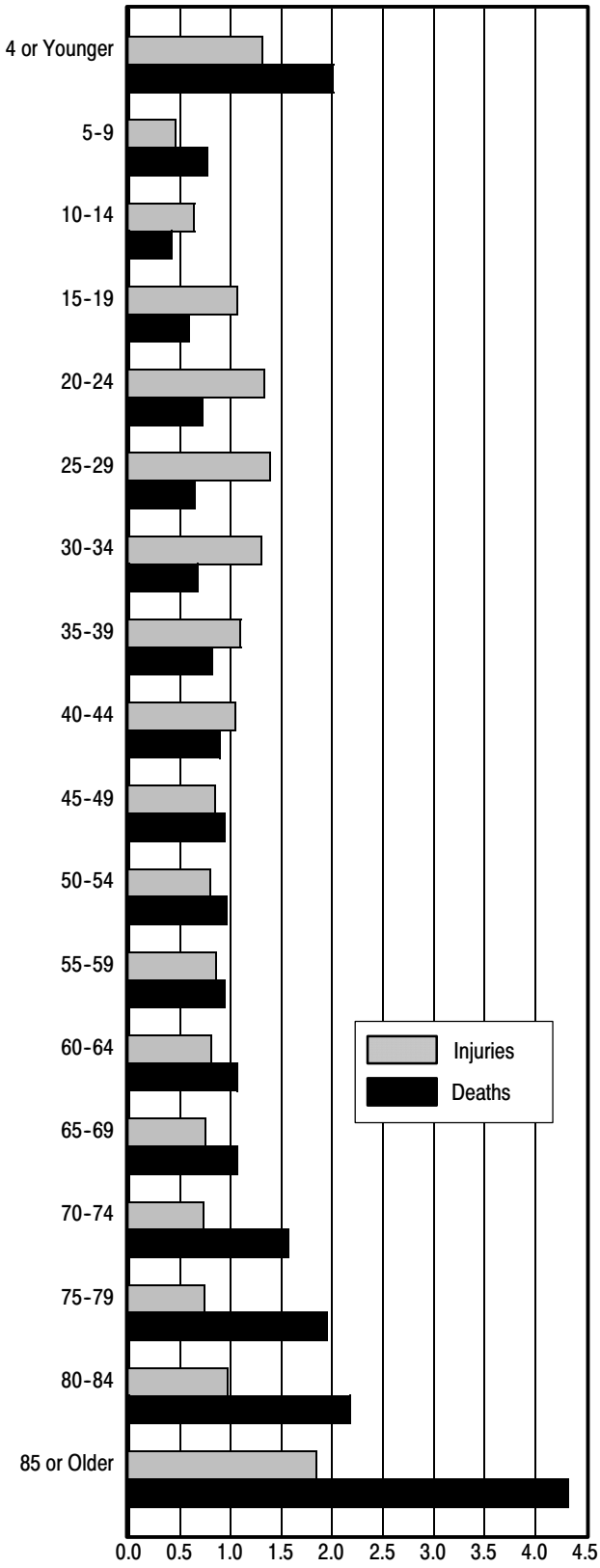
The elderly and the very young are the groups at highest risk. Children under 5 years of age continue to have double the national average fire death rate (Figure 6). Risk of fire death drops off sharply for children between 5 and 14, then increases slowly with age. In 1995, the elderly—people over 70—have one-and-one-half to four times the national average fire death rate, depending on how old they are, with the risk increasing sharply for people over 80. However, two-thirds of the people who die in fires are neither very young nor old; the fire problem affects all age groups.

The risk of fire injury peaks at ages 25–29. Young adults have a 40 percent greater risk than average. They tend to



Sources: NFIRS

Figure 5. Causes of 1995 Fires and Fire Losses (Adjusted)



Sources: NFIRS, NFPA Annual Surveys, and Bureau of the Census

Figure 6. Relative Risk of 1995 Fire Casualties by Age

be involved in the more dangerous activities and demonstrate a higher degree of bravado and fearlessness. People over 85 also have sharply elevated risk of fire injury.

Men are twice as likely to be killed in fires than women in 1995, the same as in previous years. This proportion has remained relatively stable over the past 10 years, is true for virtually every age group, and has been reported every year since NFIRS started in 1975. Males also have a higher fire death rate per capita than females for all age groups. For some age groups, the male rate is nearly triple the female rate. Elderly men have a significantly higher fire death rate than elderly women. The male/female ratio for fire deaths is almost identical to that for fire injuries.

The reasons for the differences between the sexes in fire risk are not known for sure. Some reasons advanced are the greater likelihood of men being highly intoxicated, the more dangerous occupations of men (most industrial fire fatalities are males), the greater use of flammable liquids by men, their greater likelihood of attempting to fight fires or going back to rescue someone, or possibly that men are less safety-conscious than women.

The fire problem cuts across all ethnic, economic, and regional groups. It is higher for some than for others. For example, people in rural areas and large cities have higher fire death rates than people in mid-size communities. The poor, too, suffer a disproportionate share of deaths versus the rest of the population.

STATE PROFILES

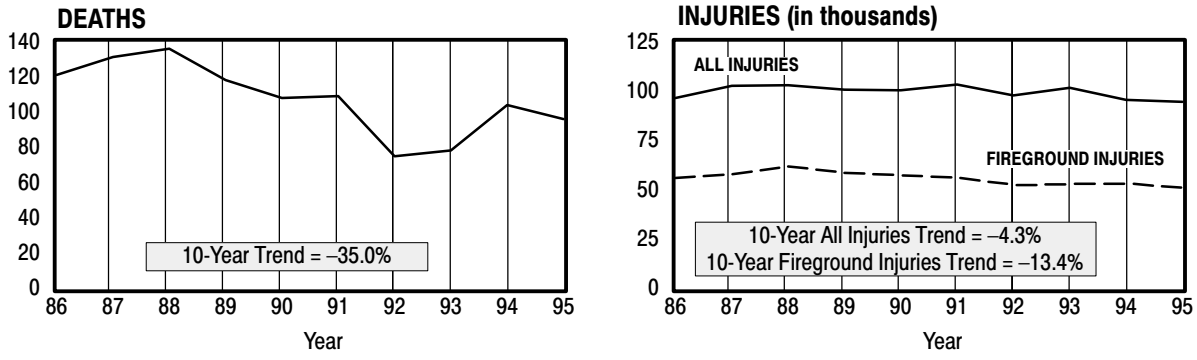
The leading causes of residential fires in 1995 were cooking, heating, and arson. This is the same ranking as reported in 1994. Cooking has been the leading cause of fires in most years, except in the 1970s when heating became the leading cause due to a surge in the use of alternative space heaters and wood heating. Most cooking fires come from unattended cooking rather than from equipment failures.

Although cooking fires are shown as the leading causes of residential fires in most of the states, they were not reported as the leading cause of fire deaths in any state. As in all years, more states showed careless smoking as the leading cause of residential fire fatalities in 1995 than any other cause, followed by heating and arson. This sequence has little changed for many years.

There are a variety of fire prevention programs, outreach programs, and other fire-related initiatives that are offered by the states. These programs range from smoke detector handout and installation to kid's Web pages to instructional materials for educators on juvenile firesetting patterns. Some states have enacted a variety of legislative packages targeted at reducing the toll of fire. Many states have Web sites with up-to-date information available.

FIREFIGHTER DEATHS AND INJURIES

Much progress has been made in reducing firefighter deaths and injuries. Over the period 1986 to 1995, there has been a significant downward trend (35 percent) in firefighter deaths and a 13 percent downward trend in fireground injuries (Figure 7). Overall firefighter injuries have remained relatively constant.



Sources: NFPA Annual Surveys and the United States Fire Administration, Firefighter Fatality Project

Figure 7. Trends in Firefighter Casualties

After a steady decline in firefighter deaths from 1988 to 1992, there was a sharp increase in deaths—from 75 in 1992 to 104 in 1994. The 1994 increase was in part due to the Storm King Mountain tragedy in Colorado in which 14 firefighters were killed. Ninety-six firefighters died in 1995. In 1995, 78 percent of fireground firefighter deaths were at residential and wildland fires.

The number of firefighter injuries continued to average about 100,000 per year. Approximately 54 percent of the firefighter injuries were on the fireground. Of the firefighter injuries associated with fires, 58 percent occurred at residential fires and 28 percent at non-residential structural fires. Slightly more firefighters are injured outside at the scene of the fire than inside. More injuries occur at apartments than in other residential occupancies. Manufacturing and storage occupancies are the most injurious non-residential occupancies.

The torso, arms and hands, and legs and feet are about equally distributed as the body areas most often injured. Firefighter injuries are spread over the day, throughout the year, and across various age groups. They peak at night, in the summer and again in the winter, and between ages 30 and 34. Local fire departments should consider their own profile of injuries and the reasons for any peaks in the profiles.

THE USES OF NFIRS DATA

The National Fire Incident Reporting System is an information system initiated and supported by the U.S. Fire Administration. Developed as a means of assessing the nature and scope of the fire problem in America, the system first came on line in 1975. Since its inception, the system has grown in both participation and use. In 1995, more than 13,000 fire departments in 40 states reported to NFIRS. It is estimated that 42 percent of all fires that fire departments respond to are captured in NFIRS. The nearly one million fires that are entered into the system each year make NFIRS an extremely large and valuable sampling of fires that occur each year. The longevity of the system is valuable in identifying long-term fire trends and tracking the effectiveness of fire prevention initiatives and policies.

Perhaps the most fundamental use of the data is in understanding the nature of the fire problem, whether conceived at the national, state, or local level. One indicator of the system's usefulness is its use by many state and local fire marshal offices in preparing their annual reports.

The uses of NFIRS data are diverse. The data are used by the Consumer Product Safety Commission to evaluate fire hazards associated with specific products; law firms use the data to establish whether a product has a pattern of causing fires and thereby either litigate court cases or settle cases out of court; and the media frequently call USFA or other organizations to get fire-related information as background material for articles and features. Other users of NFIRS data include local, state, and federal agencies; private industry; academic and research groups; and nonprofit fire-related organizations. The uses of the data are as varied as the users themselves. NFIRS is a powerful data source that is readily available to the fire community and others.

SOCIOECONOMIC FACTORS AND THE INCIDENCE OF FIRE

Research indicates that the risk of fires in the home is not the same for everyone. Climate, building stock characteristics, and human factors importantly influence fire rates. Socioeconomic factors are associated with increased fire rates at three different levels—the neighborhood, the household, and the individual.

The well-being of an urban residential neighborhood is generally tied to the quality of its housing stock. The quality of the stock, however, can be diminished by the interrelated processes of fire and building abandonment. Poorer neighborhoods may be more vulnerable to the threat of fire than their more affluent counterparts for several reasons: the presence of vacant and abandoned buildings, the resulting neighborhood decline, and increased rates of arson. A statistical analysis of fires in Toledo, Ohio, revealed that the poorest group of census tracts experienced over 14 times the number of incendiary or suspicious fires versus the wealthiest census tracts.

Household-level factors relevant to fire rates include the quality of individual housing units, their affordability to residents, and the social structure of the households that reside in them. In the United States, housing quality and housing affordability are closely related. The cost of a housing unit, whether for sale or to rent, is priced according to the quality of the unit given its location, amenities, and the like. The resulting effect is that higher income households can generally afford to live in higher quality units than lower income households.

Socioeconomic factors associated with increased fire risk at the individual level include the incidence of smoking, the incidence of alcohol and drug abuse, education levels, and the type of housing tenure. Research has shown that cigarette smoking is inversely related to income. Low income households can be at greater risk from fires caused by careless smoking. In the Toledo study, this relationship was confirmed. The rate of careless smoking fires for the lowest median income group was 8.5 times the rate for the highest median income group.

More research is needed to develop, clarify, and fully understand the range of socioeconomic characteristics associated with increased fire risk. Information about these socioeconomic characteristics can help the fire service design effective public education programs. With materials designed with specific audiences in mind, the fire service can design campaigns to target fire prevention in communities and neighborhoods most at risk.

Appendix D
The Rural Fire Problem

THE RURAL FIRE PROBLEM IN THE UNITED STATES

Federal Emergency Management Agency
United States Fire Administration

EXECUTIVE SUMMARY

This report summarizes the findings from an extensive analysis of the fire problem in rural areas of the U.S. While there are many similarities between fires in rural and non-rural areas, there are also many differences. Some of the differences, such as the higher incidence of heating fires in rural areas, point to issues that need to be considered when designing public education programs to reduce the number of fires and the deaths, injuries, and property loss associated with rural fires. For the purposes of this report, "rural" is defined as all counties that have populations of fewer than 20,000 persons and that are generally not adjacent to metropolitan areas.

The most important findings of this study are summarized below:

Rural Fires

- The leading cause of fires is different in rural areas than in non-rural areas. ***Heating*** is the leading cause of residential structure fires in rural areas and causes 34 percent of rural residential fires. Heating is the cause of only 15 percent of residential fires in non-rural areas. In contrast, cooking is the leading cause of residential fires in non-rural areas.
- ***In particular, the lack of maintenance of heating devices is a serious cause of residential heating fires in rural areas.*** Lack of maintenance includes creosote build-up in chimneys and stovepipes. Lack of maintenance was cited in 78 percent of rural heating fires. This suggests a critical need for public education in rural areas to make people aware of the hazards of not properly maintaining heating equipment, chimneys, and vents.
- Stationary heating units are the leading type of equipment involved in ignition of rural residential heating fires. Chimneys, vents, and flues are the second leading category of equipment involved in ignition. Together, these two types of equipment account for 62 percent of all rural heating fires. ***Interestingly, "fixed stationary" rather than "portable" heaters are identified as the culprit in this analysis.***
- Because of the prevalence of heating fires, the most common area of fire origin in rural fires is ***chimneys***. The next most common areas are cooking areas and lounge areas. Heating equipment rooms are identified as the area of fire origin in only a small proportion of rural heating fires, suggesting that most rural heating fires are not related to central heating.
- Heating is the leading cause of residential fires in rural areas of both the northern and the southern states. Because of the climate, however, heating is a more predominant cause in the North.
- ***The lack of working smoke detectors is a significant problem in rural areas.*** Smoke detectors were present and operational in only 27 percent of rural residential fires (versus 35 percent of non-rural fires).
- The lack of working smoke detectors is an even greater problem in rural areas of the South than in rural areas of the North.

- The extent of flame damage that residential structures sustain is worse in rural areas than in non-rural areas. This is likely due to two factors. Emergency response times are longer in rural areas due to longer travel distances. Additionally, fires may burn longer before being noticed in rural areas due to lower population densities.
- The leading causes of fires in manufactured housing in rural areas are similar to other types of rural residences.
- The lack of working smoke detectors in manufactured housing is a significant problem. Seventy-five percent of rural manufactured homes that experienced fires do not have an operating smoke detector.

Rural Fire Deaths

- Fire death rates are significantly higher (35 percent higher) in rural areas compared to non-rural areas. These differences are even greater when comparing fire death rates across race and ethnicity groups.
- Within rural areas, the majority of annual fire death victims are White. In per capita terms, however, African Americans and Native Americans have higher risks of dying as a result of fires than do Whites.
- While the death rate is higher in rural areas and for certain subgroups of the population, the distributions of fire deaths by age, race, and gender are similar in "rural" and "non-rural" areas.

Appendix E
Technical Reports

United States Fire Administration

Technical Report Series

Eight Children and Two Adults Die in Rural House Fire Remer, Minnesota

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

U.S. Fire Administration Fire Investigations Program

The U.S. Fire Administration develops reports on selected major fires throughout the country. The fires usually involve multiple deaths or a large loss of property. But the primary criterion for deciding to do a report is whether it will result in significant "lessons learned." In some cases these lessons bring to light new knowledge about fire -- the effect of building construction or contents, human behavior in fire, etc. In other cases, the lessons are not new but are serious enough to highlight once again, with yet another fire tragedy report.

The reports are sent to fire magazines and are distributed at national and regional fire meetings. The International Association of Fire Chiefs assists USFA in disseminating the findings throughout the fire service. On a continuing basis the reports are available on request from USFA.

This body of work provides detailed information on the nature of the fire problem for policymakers who must decide on allocations of resources between fire and other pressing problems, and within the fire service to improve codes and code enforcement, training, public fire education, building technology, and other related areas.

The Fire Administration, which has no regulatory authority, sends an experienced fire investigator into a community after a major incident only after having conferred with the local fire authorities to insure that USFA's assistance and presence would be supportive and in no way interfere with any review of the incident they are themselves conducting. The intent is not to arrive during the event or even immediately after, but rather after the dust settles, so that a complete and objective review of all the important aspects of the incident can be made. Local authorities review USFA's report while it is in draft. The USFA investigator or team is available to local authorities should they wish to request technical assistance for their own investigation.

This report and its recommendations were developed by USFA staff and by TriData Corporation, Arlington, Virginia, its staff and consultants, who are under contract to assist the Fire Administration in carrying out the Fire Reports Program.

The U.S. Fire Administration appreciates the cooperation received from the State Fire Marshal of Minnesota Tom Brace and the following members of his staff: Chief Investigator David E. Knefelkamp. Supervisor-Deputy State Fire Marshal Elmer H. Baltes, Deputy State Fire Marshal-Investigator David L. Bahma, and Deputy State Fire Marshal-Investigator Ronald C. Rahman.

Eight Children and Two Adults Die in Rural House Fire Remer, Minnesota (January 1, 1989)

Investigated by: Daniel J. Carpenter, Jr.

This is Report 028 of the Major Fires Investigation Project conducted by TriData Corporation under contract EMW-88-C-2849 to the United States Fire Administration, Federal Emergency Management Agency.

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

Eight Children and Two Adults
Die in Rural House Fire

Remer, Minnesota

Investigated by: **Daniel J. Carpenter, Jr.**

Contacts: **Thomas R. Brace, State Fire Marshal**
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OVERVIEW

Only two hours into the New Year, 1989, the small rural town of Remer, Minnesota, located approximately 85 miles west of Duluth, Minnesota experienced the most devastating single-family house fire in the State's history.

Ten people perished, apparently as they slept, when a fire rapidly spread through an old two-story schoolhouse that had been moved onto the site and converted for use as a residential occupancy. Eight children from three families and the parents of two of the children died in the fire. The surviving parents of four of the children had left the house at about 2300 hours that evening, New Year's Eve, to celebrate a birthday at a local Pub. They came home at about 0230 to discover the house ablaze and firefighters on the scene.

Specific cause of the fire was undetermined. Strong consideration was given to faulty electrical, over-fused circuits and human factors after extensive investigation and statements made by the victims prior to the fire and in statements written in a journal by Kimberly Smischney, one of the children killed in the fire.

There were no smoke detectors present in the home when the fire occurred.

SUMMARY OF KEY ISSUES

Issues	Comments
Detection	The fire was discovered early New Year's morning by a passerby. Much of the home had already been destroyed by the time the Fire Department had arrived.
Casualties	Ten dead, two adults and 8 children. All fatalities had high carbon monoxide levels and were believed to be sleeping at the time of death.
Smoke Detectors	None present. Early detection devices presumably would have saved at least some of the occupants.
Structure	Two-story wood-frame structure dating from the 1920's; was originally a schoolhouse. Heat was provided by a wood-fired furnace. Housekeeping and upkeep were reportedly very poor; structure contained a heavy combustible load. Insurance had been refused on the property.

BACKGROUND

This was the largest loss of life fire in a single-family dwelling in Minnesota's history since records have been kept.

Remer, Minnesota is a small rural community with a population of 396. The surrounding area is primarily a farming community of low and middle income families. Fire protection is provided by the Remer Volunteer Fire Department. The apparatus operated by the Fire Department included two 750 GPM engines, a 1,500 gallon tanker, a 4 X 4 rescue unit, and a breathing apparatus unit equipped with a compressor.

Department training is conducted monthly. Additional training activities are provided by the Minnesota Vocational Technical System which conducts live and simulated fires on buildings and provides portable training equipment and a trailer for training firefighters in a smoke filled atmosphere on the proper use of self-contained breathing apparatus.

THE STRUCTURE (HOUSE)

The structure was a two-story wood-frame country schoolhouse, which was purchased by the present owner in the early 1940's. The building was moved to a rural area approximately 2.3 miles from the town of Remer and converted to a residential occupancy. It was situated about one tenth of a mile off state Highway #6. The schoolhouse is believed to have been built in the 1920s.

The main floor consisted of one bedroom, a kitchen/dining area, a bathroom, and a living room, with an attached woodshed at the rear. There were four bedrooms, a library, and a bathroom on the upper floor. Interior finish was reported to be wood paneling and pressed wallboard. The dimensions of the structure were reported as 32' X 21', with an attached small woodshed and an 11' X 33' attached workshop.

John and Nancy Watson and their four children had recently moved into the wood-frame home for the winter months while the owner (Nancy Watson's and Rebecca Smischney's father) went south. John and Nancy lived the rest of the year in a mobile home located on the property. The mobile home was

equipped with a hard-wired smoke detector and one battery operated smoke detector, however, the frame home they moved into for the winter had no smoke detectors installed. The owner of the home was an inventing engineer by trade. He reportedly never threw anything away and the basement was quite full of things he had collected and saved for years. He also had a large collection of books in the house that he had acquired over the years. This resulted in an extraordinary fireload and generated conditions that resulted in rapid fire spread.

State Fire Marshal Investigators reported an insurance agent from Remer went to the home about four months prior to the fire to consider insuring it for a mortgage application on the property. The insurance agent told investigators, "There was absolutely no reason for anyone to live like that." He also stated that he told the owners that if there were ever a fire the place would be gone. The general appearance and lack of upkeep turned him away without even considering writing the insurance requested. There had been no insurance for the past four years and no value was ever considered.

THE FIRE

The temperature in the early hours of the New Year was about zero with no detectable wind and a light dusting of fresh snow.

Rebecca and Jean Smischney (sister and brother-in-law to Nancy and John Watson) and the two Smischney children of Bemidji, Minnesota had arrived at the Watson home Saturday, December 31, to celebrate the New Year as well as Nancy Watson's birthday. John and Nancy left the house at around 2300 hours that evening to go into town to have a drink and get some cigarettes. Mrs. Watson's brother-in-law, Jean Smischney said he would watch the kids while the Watson's were in town. Nancy and John went to the local pub and stayed there until after the New Year's fanfare before returning home.

Reports after the fire indicated that the victims may have spent much of the night watching videotape movies before they went to bed. John and

Nancy reported that the kids and Rebecca were in bed before they left the house that evening.

The fire was reported at 0209 on New Year's Day via a 911 call to the sheriff's office who dispatched the Remer Fire Department. The 911 call was made by a neighbor of the Watson's who had been alerted by a passing motorist that the house across the road was on fire. Further observation by the neighbors indicated that the fire was burning throughout the entire structure and had burned through the roof.

A Cass County Sheriff's Deputy monitoring the call while en route and approximately one mile from the incident confirmed that flames were visible in the area. Upon arrival the Deputy noted the structure was totally engulfed. He encountered a neighbor running across the field toward the fire who stated the people that lived in the house were not at home, however, he was certain there were children in the residence. The Deputy immediately ran around the entire perimeter of the structure and found no evidence or tracks in the fresh snow or signs of anyone having escaped the structure. He estimated the Fire Department arrived approximately 5 to 7 minutes after his arrival on the scene.

The first arriving firefighters immediately laid two hose lines and began attacking the fire. The fire was knocked down in approximately 15 minutes, but most of the structure had been consumed prior to the arrival of the Fire Department.

Ten members of the Remer Fire Department responded to the fire, with a 750 GPM engine and a 1,500 gallon tanker, using a 2,000 gallon drop tank. Water was shuttled to the scene from the town of Remer. The fire was extinguished using approximately 10,000 gallons of water. The winds were calm with sub zero temperatures throughout the night. The only remaining portions of the structure after extinguishment was a small portion of the north end, including the workshop and the woodshed. The first and second story of the structure has collapsed into the basement except again for a small portion of the north end located adjacent to the workshop.

Remer Fire Chief Leo Renn indicated that the fire spread very quickly and that it was unlikely that without early warning anyone would have awaken before being overcome by smoke. Several of the victims were found on couches or the beds on which they had been sleeping.

John and Nancy Watson returned to the house to find it ablaze. Inside were their four children; Nancy Watson's visiting sister Rebecca and brother-in-law Jean Smichney and their two children; also present in the home were two neighbor children who were spending the night. All ten occupants perished in the fire.

THE VICTIMS

The grim work of recovering the bodies began at daybreak after the arrival of Deputy State Fire Marshal Investigator Dave Bahma. A city backhoe was brought in from town to assist in debris removal for recovering the bodies and investigation purposes. Only the attached workshop and woodshed at the north end of the structure and a small attached section of upstairs flooring remained standing. Five bodies were found upstairs, and five bodies were found in the basement because the upper floors in which they were sleeping had collapsed during the fire. There was no indication any of the victims had awaken or tried to escape. Autopsies revealed that all the victims died from smoke inhalation. Dental records were used to positively identify the victims.

FIRE CAUSE

The specific cause of the fire was undetermined. Several probable causes related both to building features and human factors were investigated.

Causes Eliminated

The old fuel oil space heater was ruled out as it had not been used for years. The control was in the off position and there was no external fuel supply connected to the unit.

The homemade wood furnace was ruled out as a possible cause after careful examination of the unit and its components. However, it was noted the furnace duct system was homemade using 2-inch planking with tin tacked onto it. (It should be noted it is not acceptable practice to utilize wood or framing members to distribute heat in a hot air system under any circumstance. This was one more inherent danager existing in the house prior to the fire.)

A cooking-related fire was ruled out after examination of the stove and oven controls which indicated they were in the off position.

Possible Fire Cause -- Structual

Electrical Distribution System - The fuse panel was examined and found to contain 20 and 30 amp fuses installed in circuits designed to be fused with 15 amp fuses. This coupled with information from several sources gives a strong indication this may have been the cause of the fire. John Watson stated that on several occasions a light switch located in the basement at the south end of the house had not been working properly. He would have to flick it several times in order for the light to go on. In addition, information Jean Smichney relayed to his brothers indicated there were recurrent problems with the electrical system and lights going out in the residence. Mr. Smischney's brother further stated that Jean had also told him the house was a fire trap. Kimberly Smischney also kept a journal at school that consisted of two pages in which she made mention of unusual electrical occurrences at the Watson house in Remer. In addition, Kimberly's teacher remembered the young child telling her that the lights would go out when the children ran across the floor.

Possible Fire Cause -- Human Factors

The family Christmas tree was a live tree that was put up on December 10. Upon investigation the only remaining recognizable indication of the tree was the Christmas tree stand. The stand was a homemade device that consisted of metal cross members with metal stabilizing brackets. It did not hold water. John Watson stated there were two sets of lights on the

tree, and Nancy Watson stated the lights were on when they left the house that evening. The lights consisted of one string of the newer style small lights and one string of large lights that were an older type. The Christmas tree was located in an area of total burn out.

John Watson and Jean Smischey were both smokers. The night John and Nancy left for town, John stated that all the children and Rebecca were in bed and that Jean was on the couch watching TV and said he would watch the kids while the Watsons went to town. It is not certain if Jean later went to bed or fell asleep on the couch. In either case another potential fire cause may have been related to smoking.

John Watson told State Fire Marshal Investigators that it may have been caused by cigarette ashes as their standard practice was to dump the ashes into a paper bag in the kitchen which Jean may have done before going to bed.

The possibility the fire was deliberately set or was caused by children playing with fire was eliminated for the following reasons:

There was no insurance on the home nor members of the family except Rebecca and Jean carried $25,000 life insurance that was added to their estate and just covered funeral costs. Therefore, there was no financial gain incentive.

The children were in bed and sleeping before the Watsons left that evening.

There were no known enemies of any of the families. The Watsons got along well with neighbors and the children were liked in school. The Smischneys and Watsons got along well.

The Watsons stated there had been no threats against them.

There were no traces of accelerant or incendiary devices found.

There were no footprints or tracks in the fresh snow other than those belonging to the Watsons as determined by the Sheriff's Deputy assigned to the case.

This fire is considered accidental in nature with strong consideration given to the electrical system in the house and/or careless handling of smoking materials or other human factors.

THE AFTERMATH

Remer residents said the deaths are especially tragic because the town is small with only about 400 residents.

Nancy Watson was a lifelong resident of Remer and had grown up in the house. It was reported that the Watsons were a very close-knit family.

Members of the Remer Fire Department were also extremely shaken as a result of this tragic fire in their community.

More than 1,000 people filed into the local high school gym to mourn the deaths. In order to help deal with the tragedy, school officials decided to bring in two psychologists. The elementary school opened an hour late after the holiday break so teachers and staff could meet with counselors before the students arrived. The counselors were available throughout the day to meet with classes or individual students.

LESSONS LEARNED

1. Fire Safety Education and Awareness

This fire was a classic example of the need for the public to be aware of fire safety issues in their everyday lives. Parents need to be motivated to action in order to protect their families. It was indicated that Fire Prevention Week was observed in the Remer schools in October. The school conducted fire drills and encouraged students to practice at home. However, there were no lesson plans available for the students to

take home. In addition, the Fire Department brought an engine to the school to familiarize the children with the equipment and firefighters in gear.

2. Family Escape Planning and Smoke Detectors

It was stated the mobile home the Watsons lived in prior to moving into the converted schoolhouse was equipped with smoke detectors. This would indicate some awareness of fire safety. However, there were no smoke detectors present in their current residence prior to the fire.

The significance of smoke detectors in dwellings occupied by families and where families may visit needs to be stressed. Fire safety is not only a home issue but should be a consideration wherever the family may be. It is therefore imperative that parents ask the question "Are there smoke detectors present in all environments where my children may be sleeping." This would include their own homes, relatives homes, and any time they may be away such as with school activities, at camp, while babysitting, etc.

Along with installation and maintenance of smoke detectors comes the need to have a well-developed and practiced escape plan that would include information on sleeping with bedroom doors closed, planning two ways out of every sleeping room, establishing a meeting place, and calling the fire department.

3. Smoking and Smoking Material Safety

It is apparent that even though specific cause was not determined in this tragic fire the safety practices in regard to smoking were poor. John Watson stated that normal practice was to empty discarded smoking materials into a paper garbage sack before retiring or whenever the ash tray was full. Smoking has long been identified as a major fire problem and is a message that needs to continually be presented to the public. Proper disposal of smoking materials and inherent dangers of inappropriate disposal also needs to be addressed.

4. Heating Safety

Careful study into the wood furnace heating system installed in the structure revealed a serious potential for a fire to occur as a result of the design and construction. The ductwork for distributing the heat was made of wood. Wood heating and other such alternate heating devices are a major cause of fire in many areas of the country. Behaviors that need to be addressed should include installation of the device, proper maintenance, disposal of ashes, clearances, proper types of fuel, and again early warning devices. The heating system in this particular house was an accident waiting to happen.

5. Electrical Fire Safety

Cause and effect of improper fusing of electrical distribution systems along with general electrical knowledge, to include, what it means or what you should do when electrical problems occur should be taught. Overloading circuits and defeating protective devices is a problem that needs to be addressed. It was apparent there were serious electrical problems existing in the Watson home prior to the fire.

6. Holiday Fire Safety

Christmas is only one of many holidays that have a potential for a fire. In this instance the use of a live Christmas tree brought into the house and put into a stand that did not provide a means to keep it watered created yet another serious problem. In addition, Minnesota had experienced a very dry year in 1988 with little moisture. The homeowner cut his own Christmas tree long before the holiday. It was set up inside on December 10 and remained set up for 21 days without water. Lights were also added to the tree which created an additional potential fire problem for the already dry tree.

7. Housekeeping

Housekeeping is a serious issue that is not often addressed in most fire safety programs. The fire load that existed in this particular

dwelling seriously impacted fire spread and contributed a tremendous amount of fuel. Fuel load can generate rapid spread of fire and can reduce the amount of time one would have to escape in a fire situation. Poor housekeeping and extreme fire loading can also hamper firefighters during rescue and extinguishment.

8. Post-Incident Stress

In any community people who know the victims of a fire, including children, may need emergency psychological assistance to recover from the emotional shock and grief. It is important that all communities have addressed in their emergency plans a means of dealing with Post Traumatic Stress in a timely manner. Firefighters as well are in need of such programs and help needs to be available immediately in some cases.

United States Fire Administration

Technical Report Series

Nine-Fatality Mobile Home Fire
Maxton, North Carolina

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

U.S. Fire Administration Fire Investigations Program

The U.S. Fire Administration develops reports on selected major fires throughout the country. The fires usually invovle multiple deaths or a large loss of property. But the primary criterion for deciding to do a report is whether it will result in significant "lessons learned." In some cases these lessons bring to light new knowledge about fire -- the effect of building construction or contents, human behavior in fire, etc. In other cases, the lessons are not new but are serious enough to highlight once again, with yet another fire tragedy report.

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This body of work provides detailed information on the nature of the fire problem for policymakers who must decide on allocations of resources between fire and other pressing problems, and within the fire service to improve codes and code enforcement, training, public fire education, building technology, and other related areas.

The Fire Administration, which has no regulatory authority, sends an experienced fire investigator into a community after a major incident only after having conferred with the local fire authorities to insure that USFA's assistance and presence would be supportive and in no way interfere with any review of the incident they are themselves conducting. The intent is not to arrive dur-ing the event or even immediately after, but rather after the dust settles, so that a complete and objective review of all the important aspects of the incident can be made. Local authorities review USFA's report while it is in draft. The USFA investigator or team is available to local authorities should they wish to request technical assistance for their own investigation.

This report and its recommendations were developed by USFA staff and by TriData Corporation, Arlington, Virginia, its staff and consultants, who are under contract to assist the Fire Administration in carrying out the Fire Reports Program.

The U.S. Fire Admfnfstration appreciates the cooperation and assistance received from Robeson, County Fire Marshal Charles M. Britt and County Manager James Martin, as well as the Assistant Director of the North Carolina State Bureau of Investigation Ray Eastman and Special Agents Randy Meyers and Niel Murphy.

Nine-Fatality Mobile Home Fire
Maxton, North Carolina
(November 18, 1989)

Investigated by: Daniel J. Carpenter, Jr.

This is Report 037 of the Major Fires Investigation Project conducted by TriData Corporation under contract EMW-88-C-2849 to the United States Fire Administration, Federal Emergency Management Agency.

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

Nine-Fatality Mobile Home Fire
Maxton, North Carolina

November 18, 1989

Investigated by: Daniel J. Carpenter

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Overview

A mother (Lois Ann Hunt, 32) and her five children: Alisha, 12; Malissa, 11, Larry, 5, Bobby Ray, 3, and Nicki, 2, died in an early morning trailer fire on November 18 in Maxton, North Carolina. Also killed were their three cousins: Crystal Lynn, 6, Glenford, 4, and Daniel Presley Locklear, Jr., 2, of Route 2 in Maxton.

The mother of the three cousins who died in the fire Jo Ann Locklear (Ms. Hunt's neice) and Richard Eugene Tyndall, 22, were asleep on a sofa in the front room of the trailer when the fire occurred and were able to escape by using the front door.

Six children died in the middle bedroom of the mobile home. Jo Ann Locklear suffered minor burns to her hand and left arm when she attempted to reach them through a window from outside the trailer. Lois Hunt died in the back bedroom and the other two children in another room.

The Fire

The fire occurred at approximately 0345 on Saturday. The Smiths Volunteer Fire Department answered the call from a neighbor, who had called the telephone operator.

According to early reports, the fire started in the area of a kerosene heater located in the hallway between the bathroom door and the back door of the 3-bedroom, 60-foot long trailer. The location of the heater and the intensity of the fire prevented the occupants from leaving by the back door of the trailer. According to Robeson County Fire Marshal Charles Britt, the Smiths Volunteer Fire Department was dispatched along with the Prospect Volunteer Fire Department. Both departments arrived at the scene of the fire in 10-12 minutes only to find the trailer fully engulfed in flames.

Neighbors indicated an explosion occurred during the early stages of the fire which may have contributed to the rapid spread of the fire.

Background

Ms. Locklear, who was visiting the Hunt family, said that Ms. Hunt told her oldest daughter, Alisha, to be sure the kerosene heater was filled before going to bed at approximately 1000 hours the evening before the fire. Early the next morning (0300 hours) she awakened to hear Ms. Hunt again tell Alisha to refill the heater. Alisha responded, but stated the can was too heavy to lift. Ms. Hunt told Alisha to wait and she would help her after she finished getting ready for work. Alisha proceeded to drag the five gallon "Gerry" can down the hall and refill the the heater. Burn patterns indicate that she apparently spilled some liquid on the floor in the area of the heater, which ignited shortly thereafter.

It is not determined if Alisha re-ignited the kerosene heater and went back to bed, but shortly thereafter Jo Ann Locklear and her companion Richard Eugene Tyndall heard Ms. Hunt screaming "save the babies." Ms. Locklear and her companion exited by the front door and proceeded to break

out the children's bedroom window where six of the children were sleeping. They were able to grasp one of the children's hands but were unable to accomplish rescue because of the intense heat and flames. They could also hear some of the other children crying which would indicate that at least some, if not all, of the children were awake at the time of the fire.

Preliminary investigation of the heater revealed that the glass inserts used to view the flame and also the door to adjust the levelof the wick were both missing. This could have been the direct ignition source of heat. There were no smoke detectors nor sprinkler systems in the trailer. It is also believed that the bedroom doors were open during the fire, which would help cause the rapid spread of the fire.

Lessons Learned

1. Public education and manufacturers' instructions need to focus on proper use and location of portable space heaters, especially those involving kerosene.

Due to misuse they have been involved in many fires resulting in deaths and serious injuries, especially in rural areas in the Southeast, such as where this fire occurred.

2. Families living in mobile homes must have working smoke detectors.

This should be a focus of rural puolic fire education, and can be directed to concentration of mobile homes.

3. Families livinq in mobile homes need to plan and practice ways to get out from bedrooms with small windows.

Many people, especially children, die because they cannot escape from these rooms at night.

4. Emergency exit doors are needed and should be encouraged.

Sometimes jalousied windows in mobile homes make escape virtually impossible.

5. Sprinklering mobile homes would surely reduce the high fire death toll from fire's such as this one.

United States Fire Administration

Technical Report Series

Shenandoah Retirement Home Fire
Roanoke County, Virginia

Federal Emergency Management Agency

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The U.S. Fire Administration appreciates the cooperation and assistance received from Fire Chief T.C. Fuqua and Fire Marshal Ken Sharp of the Roanoke County Fire and Rescue Department as well as Ottis L. Burgher, Administrator, Shenandoah Homes, Roanoke, Virginia.

Shenandoah Retirement Home Fire
Roanoke County, Virginia
(December 14, 1989)

Investigated by: Randolph E. Kirby

This is Report 038 of the Major Fires Investigation Project conducted by TriData Corporation under contract EMW-88-C-2649 to the United States Fire Administration, Federal Emergency Management Agency.

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

Shenandoah Retirement Home Fire
Roanoke County, Virginia

Investigated by: **Randolph E. Kirby**

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OVERVIEW

On December 14, 1989 at 0214 hours, a fire alarm was recevived by the Roanoke County Fire Dispatch Center from the Shenandoah Retirement Home Center. This is a 6 1/2-story masonry building housing 175 elderly persons. Many of the occupants require canes and walkers for mobility. The second floor of this home is licensed by the state as an adult care center for some 48 persons requiring custodial supervision. On December 14 the building was occupied by 135 residents and three staff members. The building actually houses more than this number, but several were visiting family members or were in the hospital.

The first firefighting units arrived 18 minutes after notification of alarm and saw fire coming from a third floor apartment window at the front of the building. Firefighters entering into the building by way of stairwells located at each end of the structure were met by occupants leaving from the upper floors, and with smoke which was already permeating the stairwells. On the third floor they found heat and heavy black smoke from floor to ceiling. Additional fire personnel and equipment had already

SUMMARY OF KEY ISSUES

Issues	Comments
Cause	Believed to be electrical loading of wall receptacles in a third floor room which ignited prefinished wall paneling.
Detection & Reporting	Fire was detected by hallway smoke detector, sounding building alarms and automatically notifying Fire Department.
Fire Fighting	Heavy black smoke, generated from burning prefinished wood paneling, permeated entire third floor, making search and rescue extremely difficult and time-consuming.
Fire Department Response	Eighteen minutes elapsed between. alarm notification and the arrival of first fire fighting equipment. This delay probably contributed to extent of smoke and flame damage.
Code Compliance	Building not subject to current~code.. requirements for fire sprinklers and smoke evacuation systems since it was constructed in 1970, prior to such requirements.
Building Structure	Sound masonry and concrete construction prevented serious structural damage. Building was constructed under earthquake building requirements.
Building Occupants	Building is fully occupied by upper age group senior citizens, the majority of whom use canes, walkers, and wheel chairs for mobility, which complicated the evacuation process.
Interior Finish	Apartment units and center core elevator lobby areas on each floor have highly flammable prefinished wood paneling, which produced rapid flame spread and smoke.

SUMMARY OF KEY ISSUES (cont'd)

Issues	Comments
Building Evacuation	While residents throughout the building began to evacuate immediately, exit from the third floor was complicated because of heavy, thick black smoke.
Emergency Disaster Plan	Roanoke County's Emergency Disaster Plan for evacuation and shelter management worked almost perfectly and was a major factor in minimizing further injury and possible death to occupants.
Emergency Vehicle	Poor access to the building and fire hydrants required placing apparatus on lawn to reach a fire hydrant and structure, which hampered proper placement of additional apparatus.
Weather Conditions	Frigid temperature (14°F), snow, and ice-covered roads complicated equipment. placement and resident evacuation to transportation vehicles.
High Fire Load & Lack of Fire Inspections	A sampling of apartments revealed high fire loads from storage of furniture and other possessions, and improper use of electrical distribution. Infrequent inspections of apartments by building management, and lack of county authority to inspect them, allowed these conditions to exist.

been alerted by Fire Dispatch as a result of an on-duty sheriff's deputy who witnessed the fire's progress prior to fire department arrival and radioed this information to the Fire Dispatch Center.

All tenants were evacuated from the second floor adult care center and were placed in the lobby because of the adverse weather conditions. Although tenants from the upper stories had begun evacuating prior to the Fire Department's arrival, some tenants were trapped in their apartments on the third floor and had to be rescued by firefighters.

Extinguishment of the fire required approximately 25 minutes. Total evacuation of the building took approximately 90 minutes. Four elderly residents died as a result of smoke inhalation; 135 tenants were evacuated and transported to an emergency shelter. In addition to the fatalities, 10 residents, 2 firefighters, and 4 police officers were injured. Eighty-eight fire, police, and rescue personnel were required to bring the scene under control.

THE FIRE

On December 14, 1989 at 0214 hours, Roanoke County Fire Dispatch received an automatic fire alarm notice from the Shenandoah Retirement Center at 5300 Hawthorne Road. At 0216 hours, Companies 5 and 10 were alerted by County Dispatch, their volunteer alert system.

A sheriff's deputy, who was in the vicinity of the Center, heard the call and responded to the Center. Upon her arrival at the scene, she observed flames coming from a third floor window located at the front of the building. She reported the situation to the fire dispatcher who immediately alerted additional fire units. The deputy entered the building through the front entrance and began assisting elderly residents who were already in the evacuation process at the north stairwell.

At approximately 0230 hours, the chief of Company 5 arrived in his private automobile. He entered the building and found the lobby full of

residents who had evacuated upper portions of the building. Most were in their nightclothes and were not dressed for the frigid weather conditions outside.

The chief proceeded to the third floor by way of the north stairwell. When he opened the third floor stairwell door, he saw that the floor was completely charged with heavy, black smoke. He began assisting residents to evacuate the building.

At 0234 hours, Wagon 5 arrived with three firefighters. They immediately started a rescue operation, concentrating on the third floor. Their initial entry was by way of the stairwell on the south end of the building. They were successful in removing one or two residents; then back-up arrived a few minutes later.

As more units arrived, rescue began from the stairwells located at both ends of the building. Firefighters experienced great difficulty in gaining entrance to individual apartments, as most apartment doors were locked. Firefighters had obtained and were trying to use a master key, but the dense, black smoke made progress slow. Many third floor residents had already evacuated, but a room-to-room search was necessary.

Meanwhile, firefighting personnel were attempting to locate a standpipe hose line which was housed in a cabinet at the south end of the third floor hallway. Because of the smokey conditions, they were unable to find the cabinet. At this point, the highrise hose pack carried on the apparatus was connected to the standpipe system located in the stairwell, at the third floor level, and advanced to the room of origin. The firefighters detected some fire in the hallway at the ceiling level in the area of the entrance of Apartment 307. Flashover had already occurred.

Meanwhile, the room-to-room search on the third floor and the evacuation of the entire building were in process. Information from fire dispatch was received by the third floor section commander that a woman was trapped in Apartment 302. Their attempts to locate Apartment 302 were made

extremely difficult because of the black soot that covered the apartment numbers. Unfortunately, they were not able to locate the woman in time to save her.

Smoke was beginning to filter to the upper stories of the building by way of stairwells and the doors being opened by people leaving the building. Smoke movement was also aided by a 9-mile-per-hour southeast wind as it came through an open window in Apartment 307.

The incident commander located at the front of the building had already established an EMS command post which was in the process of performing triage and transporting some of the residents to hospitals. The emergency service officer had activated the county disaster plan and a shelter was established at a nearby roller skating rink. It was manned by members of the American Red Cross and medical personnel from Roanoke Hospital. Four school buses had been dispatched to the scene to provide transportation of the evacuees to the shelter. Most residents were in nightclothes and needed assistance to walk; many had to be carried a relatively long distance over snow and ice and through an array of fire apparatus in order to be placed aboard buses.

Because of the limited vehicle access afforded at the site, most of the driveway was blocked by fire and medic units. The fire required approximately 25 minutes to extinguish, and total building evacuation and transportation to the shelter took about 90 minutes.

During the overhaul operations, it was determined that the fire originated in Apartment 307 and progressed to the hallway through an open door which did not close behind the occupant as he escaped from the room. His body was found in the hallway a few feet from his apartment door. The body of a female resident was found in Apartment 309. A third body was found in Apartment 304 and a fourth in Apartment 302. The majority of the fire was in the room of origin and in the hallway near this room. Smoke filtered into the other rooms where fatalities were found through spaces under and around the doors.

This fire required the services of approximately 88 fire and rescue personnel, and 35 pieces of equipment.

BUILDING STRUCTURE

This building is located in a mixed-use section of Roanoke County, predominately residential. It is a 6 1/2-story fire resistant apartment building, built for and occupied by elderly residents. The second floor is licensed by the state as an adult care center for 48 patients who require residential custodial care. The building also includes a ground floor under the south half of the building, which is used for kitchen and related services.

The building is constructed of steel framing protected by reinforced concrete. Floors are 8-inch precast concrete with a concrete topping (very similar to flexcore precast floor panels). Walls are 8-inch concrete block with a brick facing on the outside.

Floors three through six each has 24 single-occupant apartment units for a total 96 apartments. Most of the units are one-room apartments, though some units have separate bedrooms (Appendix A). The second floor adult care center is set up with 24 units also, but each houses two occupants who receive special care. The building was designed with a 6-foot-wide main corridor running the length of the building, north to south. Enclosed staircases that discharge to the outside are located to each end. Two elevators are located in the center portion of the building and are used as the lobby area on each floor. The length of the hallways is 270 feet. There are no smoke barrier doors between stairwells.

Each apartment is arranged with one or two sleeping areas, kitchen, bathroom, and a small clothes closet. The living/bedroom areas of each unit have 1/4-inch prefinished wood paneling on wood studs -- not UL rated.

CODES

The building was constructed in 1970 under a local building code which did not require sprinkler systems or smoke detectors. The building was modified in 1976 following a fatal fire after which solid core doors and a hallway smoke detection system were installed. The building is considered to be in compliance with existing building codes and is not subject to fire protection upgrading.

The last inspection by the Roanoke County fire officials was approximately 18 months prior to the fire. This inspection involved only the common areas. The second floor is inspected annually by state authorities because it is a licensed adult care center. This inspection does not involve any other portions of the building.

Examination of a few of the units revealed that some occupants are literally packing their residences with furniture and belongings, and are utilizing multi-gang electrical adapters for numerous electrical appliances. While authority is not granted to the county to enter and inspect living units, this does not prevent building management from inspecting these areas.

FIRE PROTECTION

The building is equipped with an 8-inch standpipe system connected to the city water main, with hose outlets located in cabinets at each end of the main corridor and the elevator core area. Two-and-one-half inch outlets for fire department use are provided in each stairwell. The trash chute and the trash collection room on the first floor are sprinklered.

The building is equipped with an automatic fire alarm system with pull stations located near stairwell doors on each floor. Smoke detection for hallways is also connected to this system. Battery-operated emergency lights are located in each floor hallway.

Emergency vehicle access is considered very poor, as space for vechicles near the building is extremely limited.

Two fire hydrants are installed on the property. Only one, however, is accessible by roadway.

Each room is provided with a pull switch connected to a light located in the first floor office, in the event assistance is needed. The building does not contain a sprinkler system. Individual apartments are equipped with smoke detectors that are battery operated.

Water main pressure in this area is between 50 to 60 lbs.

ORIGIN AND SPREAD OF FIRE AND SMOKE

The fire originated in apartment 307 and is believed to be the result of an electrical overload which caused ignition of wood paneling; This particular one-room unit had 17 appliances of various types connected.to the electrical receptacles provided for the unit (see Appendix B).

The wood paneling began to burn rapidly, generating tremendous heat and smoke. Because the room was not equipped with an automatic sprinkler system, the fire burned unchecked.

The occupant of this unit was confined to a wheelchair. Upon his exit from the room to the corridor, his apartment door remained open, allowing smoke and heat to escape to the hall, setting off the smoke detector located near his unit in the hallway.

Smoke very quickly filled the entire third floor. As residents on this floor began evacuating, smoke entered the stairwells and spread to the upper floors of the building. Flames eventually broke through the window in the room of origin, which is located on the front of the building. There was a southeast wind of approximately 9 miles per hour which helped spread the smoke.

Fire department response required 18 minutes, a factor which undoubtedly played a role in the extent of smoke spread.

The Fire Department estimates that flashover occurred between 3 to 5 minutes from ignition of the paneling.

FIRE DEPARTMENT

Roanoke County Fire and Rescue Services operates ten fire stations and three medic units with a paid staff of 45 persons. Working hours are from 7 a.m. to 5 p.m., Monday through Friday. All other times these fire stations are operated by a volunteer force. The volunteers respond from home or work. The stations are not manned after 5 p.m. Normal response time is from 4 to 7 minutes. At present, there does not exist an automatic response agreement with its neighbor, Roanoke City.

This particular incident occurred at 0214 hours, which requdired that the volunteers be notified at their homes. The temperature was 14°F, with snow and icy road conditions. Response time from the. nearest fire station to the fire scene is approximately 5 minutes. The reason it took 18 minutes to respond to this fire (other than the fact that adverse weather conditions contributed somewhat to delay) is not known at this time; however, the county administrator has organized a task force composed of fire service representatives and other county officials to determine the cause of the delay and to recommend corrective action. It is believed that the early morning hour of the fire (extra time may have been required to rouse the volunteers from sleep), and a recent spate of false alarms that repeatedly had called the volunteers to this facility may both have contributed.

BUILDING FIRE HISTORY

This building, since becoming occupied in 1972, has experienced three fatal fire incidents. The first occurred in March 1976 when an elderly female's nightgown caught on fire as a result of careless smoking. She died as a result. The second fatal fire occurred in June, 1979 and again was the result of careless smoking which ignited bed clothing. That fire, fueled by the prefinished wood paneling, very quickly engulfed a second floor room located in the adult care section. Four elderly people died and 12 others were injured. A few weeks before the most recent fire incident of December 14, 1989 there had been numerous calls to the fire department due to tenants cooking in their rooms and setting off hallway smoke

detectors. Repeated call-outs to the building for these false alarms may have created a sense of lower urgency among the vounteers called to respond in the middle of a freezing night.

BUILDING EVACUATION PLAN

There were three staff members working in the building the night of the fire -- two nursing assistants located on the second floor adult care section and a building night manager. Immediately upon notification of the fire by way of the alarm system, the nursing assistants began evacuating the second floor, moving the people to the first floor lobby area via the stairwells. At the same time, the night manager began evacuating the rest of the building. The first floor lobby area was, selected because of the adverse weather conditions and the frailty of the residents.

By the time the first firefighting unit arrived on the scene, the entire second floor had been evacuated and the remaining tenants were proceeding down the two stairwells. Building staff reacted to and followed established procedures in a very proficient manner, which undoubtedly saved lives and prevented further injuries.

IMPLEMENTING THE EVACUATION AND SHELTER MANAGEMENT PLAN

The first-arriving assistant chief established a command post in front of the building and implemented the Department's fire incident command procedures. As additional fire service personnel arrived, interior section commanders were assigned to firefighting, rescue, and evacuation procedures. An EMS command post was established, which instituted preliminary triage at the scene. The Fire Department emergency coordinator activated the emergency evacuation and shelter management plan. School buses were dispatched to the scene and residents were transported to the emergency shelter, which was a skating rink located close by. The American Red Cross disaster teams and medical personnel from the Roanoke Hospital reported to the shelter and provided blankets, bedding, food, and medical services. One hundred thirty-five residents were evacuated and transported to the shelter; ten were transported to the hospital for minor treatment.

News media were requested to broadcast information regarding the shelter so that family members would know where to come to help care for the residents. By noon of the same day, all but eight of the evacuees had been called for by family members.

Roanoke County fire and rescue services frequently practice and update their emergency disaster plans. The smoothness and effectiveness in implementing this plan in the Shenandoah fire, under adverse conditions, is truly commendable. Their success can in large part be attributed to their foresight in developing a plan and practicing it.

FATALITIES

Four elderly residents from the third floor died as a result of smoke inhalation -- three women and one man, ranging in age from 79 to 87 years. The body of the resident of Apartment 307, (area of origin), who was confined to a wheelchair, was found in the hall a few feet south of his apartment door. One female victim of apartment 309 was found in her unit on the floor next to her bed. The third victim (female) was found in Apartment 302. The fourth victim, (female), was found in Apartment 304, between the rear of the television and the window. This person was actually having a telephone conversation with the fire dispatcher while fire operations were taking place in the building. She was provided with instructions by the dispatcher regarding covering her nose and putting towels under the apartment door. Meanwhile, the dispatcher was advising firefighters on the scene of the woman's situation and her location. Because of heavy smoke conditions and locked doors, rescuers were unable to locate her in time to save her (see Appendix A).

INJURIES

Building Occupants -- Ten building residents sustained minor injuries due to smoke inhalation or stress related to the fire incident. These people were transported to the hospital and released within 24 hours.

United States Fire Administration

Technical Report Series

Seven-Fatality Fire at Remote Wilderness Lodge Grand Marais, Minnesota

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

Seven-Fatality Fire at Remote Wilderness Lodge Grand Marais, Minnesota (July 12, 1991)

Report by: James W. David

This is Report 055 of the Major Fires Investigation Project conducted by TriData Corporation under contract EMW-90-C-3338 to the United States Fire Administration, Federal Emergency Management Agency.

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

Seven-Fatality Fire at Remote Wilderness Lodge Grand Marais, Minnesota

Investigated by: **James W. David**

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OVERVIEW

An early morning fire at the Windigo Lodge in northern Minnesota left seven people dead and six injured. The fire started in the early morning hours of July 12, 199l as occupants of the lodge lay sleeping. The fire was reported to the Cook County Sheriffs Department from a phone

SUMMARY OF KEY ISSUES

Issues	Comments
Failure of early warning Fire detection	Smoke detectors used for early warning were single station battery operated units. Employees stated the only smoke detector they recalled seeing was on the first floor behind the bar, this would not be sufficient to hear on the second floor had it sounded. State statute requires smoke detectors in all sleeping rooms. Smoke detectors were present at the last inspection in 1988, however, none of the survivors stated they heard a smoke detector at any time during the fire.
Absence of a responding Fire department in the area	Due to rapid spread of fire and lack of early warning detection or alarm devices, fire department response would have probably made little, if any, difference to the outcome of the fire in terms of life loss. However, damage to the structure may have been less severe.
Failure of exit conditions to provide adequate escape from the interior of the building	Only one of the stairways between 1st and 2nd floor offered protection by way of F-R construction. None of the other stairways were enclosed from the 1st to 3rd floor. All the stairways were open to the corridor system serving the guest rooms. One enclosed stairway did exit directly to the outside, however, it was not a factor in escape.
Automatic sprinklers	None present
Compartmentation of lodge	Non-existent
Fire evacuation plans or drills	None
Outside fire escape	None present
Code requirements for enclosed stairs	UBC 1973
Fire doors	Guest rooms and at one stairway only.
Interior finish	Sheet rock walls and ceiling with heavy timber construction and exposed beams, with 3/4-inch flame-retardant-treated aspen paneling.

inside the lodge, located at the facility's only enclosed stairway, at 4:21 a.m. There was no organized fire department in the area to respond. Therefore, the Sheriffs Department notified other lodge owners in the area of the fire. The area lodge owners responded to the fire and were able to save two nearby buildings exposed to the fire with hoses and portable pumps. No attempts were made to suppress the lodge fire, since it was fully involved when the area lodge owners arrived. All that was left of the lodge following the fire was ash and metal debris.

Extinguishment finally occurred some 10 hours after the fire began by the U.S. Forest Service called by the State Fire Marshal Deputies. This was the first attempt to put water on the fire. It was not until then that fire investigators were able to work the scene.

At the time of the fire the Windigo Lodge was occupied by 14 people, seven of whom were Windigo employees and seven were guests. The seven who perished in the fire died prior to trying to escape or died while in the process of escaping. Six people were injured in their attempts to escape the building and one occupant escaped without injuries.

BACKGROUND

The Windigo Lodge, on the shore of Poplar Lake, was scenically nestled among towering pines, birch trees and lovely lakes in the Boundary Waters Wilderness Canoe Area in northern Minnesota just a few miles south of the Canadian border. In 1964, Windigo Lodge was moved from Windigo Point on Seagul Lake to its present location at Poplar Lake.

In November of 1974, the Windigo Lodge caught fire and burned to the ground. In 1975, the Lodge was rebuilt by the owners, the Ekroot family, and operated until July 1991, when it again burned to the ground.

The Windigo Lodge was licensed by the Minnesota Department of Health for 10 guests on the second floor. However, the night of the fire the lodge was filled to capacity with guests and employees on the second floor, the family and two guests on the third floor (contrary to the license agreement). Also, Mr. Ekroot, who was confined to a wheel chair, slept on the first floor.

This wilderness area, because of its lack of population, has little in fire protection resources. The closest organized fire department is Maple Hill, some 30 miles to the south of Windigo Lodge. To the north of the Lodge, approximately 12 miles, is the Gunflint Trail Fire and Rescue Squad; however, it is only equipped to provide emergency medical service.

There was an informal fire protection effort established by lodge owners in the area. Each lodge owner has a portable pump and a couple of lengths of hose to use for extinguishment. Their purpose is to respond to large fires and protect exposures. The lodge owners have no other fire fighting equipment, protective clothing, or SCBA.

THE BUILDING

The Windigo Lodge was a 3-story, wood-frame structure with a partial basement that had a walk-out to the lake. The lodge had fire exposures to the east and west which were single unit rental cabins and a sauna. The south side of the lodge faced Poplar Lake and the north abutted a parking lot and a small liquor store. (See Appendix B, diagram.)

A large, wooden deck wrapped around two sides of the structure nearest the lake. The guest rooms were located on the second floor, which was also used to house employees. The third floor was used to house the Ekroot family and Mrs. Ekroot's mother. The first floor was a bar, dining room and a lounge area that overlooked the lake. Mr. Ekroot slept on the first floor; he was handicapped and unable to make it up the stairs.

The building was used as a mixed occupancy with assembly areas on the main floor, guest rooms on the second floor, and owner's residence and guest rooms on the third floor. The small half basement was used for storage. The approximate exterior dimensions were 60 feet by 60 feet.

This 3-story structure had no vertical separations. It was constructed in 1975. The exterior walls were partial height concrete block foundation on the lake side and the rest was wood-frame construction with wooden siding. The interior walls were wood frame (UBC/UFC Type V-N) covered with gypsum wallboard in the guest rooms, corridors, residential areas and the west stairway. The bar and dining area were covered with 3/4-inch tongue-and-groove aspen paneling and had been flame retardant treated in 1987.

Structural support for the upper floors was provided by exterior walls and interior wooden columns (posts) made of white spruce logs. Interior ceilings were covered on the room side by gypsum wallboard. However, some of the wooden beams which supported the floor joists for the upper floors were exposed. The first floor ceiling was provided with fiberglass insulation presumably for climate control and/or sound transmission. The roof construction is in question; however, it was believed to be rafters shaped in a gable configuration with multiple shed dormers.

The second floor had an interior corridor arranged in roughly a "square" configuration. Ten sleeping rooms were located around the exterior perimeter of the building with solid core self-closing doors between the corridor and the sleeping rooms. In addition to the sleeping rooms, common restrooms were located along the exterior of the second floor wall near the northwest comer. The center "core" of the second floor contained a storage room and one of the stairways leading to the third floor.

Exit Configuration -- There were two stairways serving the second floor from the first floor; one located along the west wall and the other located near the northeast comer. The stairway along the west wall was of fire-resistive construction with the base of the stairs forming a vestibule which exited to the exterior or into the bar area through a 1-hour fire rated door. The northeast stairway was approximately six feet wide with no headers or partitions to interrupt smoke or fire spread.

There were two stairways from the second to the third floor; one was located along the north wall and the other was located near the center of the structure adjacent to the second floor storage area.

Large casement style windows were present in each of the sleeping rooms. Although not specifically designed as "egress windows," it appears that these were the path of escape used by five of the six survivors.

Fire protection Features -- An automatic extinguishing system was installed in the commercial cooking exhaust system. Single station smoke detectors (believed to be ionization type) had supposedly been installed in the guest rooms, corridors and at the top of the stairways. Due to the extensive destruction as a result of the fire, no remains of the smoke detectors were found. Although not required by code due to the limited occupant load, EXIT signs and emergency lighting units had been installed in the corridors of the second floor guest room area. After extensive interviews with guests it was not determined if any of the above were in place or operated at the time of the fire. Based on observations made at the time of the previous inspection, portable fire extinguishers were distributed throughout the building.

Building Service Features -- When originally constructed the building was heated with two unlisted barrel-type wood stoves. Their use was discontinued sometime later, although they may have still been present in the building. At the time of the fire the building was supplied with heat from a wood-burning device located in another building. The heat was piped from one building to another. There was a fireplace in the lounge

area, toward the lake side of the lodge; however, its use at the time of the fire was doubtful.

THE FIRE

The fire at the Windigo Lodge occurred sometime between 3:30 and 4:21 a.m. on July 12, 1991. The lodge was occupied by seven employees and seven guests at the time of the fire.

The fire was reported to the Cook County Sheriffs Department at 4:21 a.m. by Donald Anderson, a guest staying in one of the cabins. Mr. Anderson stated he was awakened by a family member who heard shouting and glass breaking. Mr. Anderson dressed and ran to the lodge where he saw people jumping from windows. He ran to the west side of the building and entered the enclosed stairway vestibule where the phone was located. Mr. Anderson stated it was hot, dark, and smoky and he could not find the phone; he then ran from the building to his pickup truck to get a flashlight. He then ran back to the west exit and was able to locate the phone. He was the first person to report the fire.

The Cook County Sheriffs dispatcher immediately reported the fire to a number of neighboring lodge owners. These neighboring lodge owners responded to the Windigo Lodge with portable pumps and hoses. The magnitude of the fire, as described by one lodge owner, was that the lodge building was fully engulfed with flames upon his arrival. Two portable water pumps were placed in service at the lake, one on the east and the other on the west side of the lodge. These hose streams were used to protect exposures. It was felt there was not sufficient hose streams to extinguish the lodge fire, therefore, no attempt was made.

The Windigo Lodge was allowed to bum throughout the day until the fire investigators were able to enlist the help of the U.S. Forest Service to bring in equipment to extinguish the smoldering remains of the structure. The investigation was then able to begin.

CASUALTIES

The individuals who perished, were injured, or escaped are as follows:

Victim	*Floor Room #*	*Affiliation*	*Dead/ Injured*
Vincent Rolland Ekroot, Sr.	1st NE comer	Owner	Dead
Vincent Charles Liestman	2nd #3	Employee	Dead
Donald Ray McComb	2nd #4	Guest	Escaped
Adam Troy Maxwell	2nd #5	Employee	Injured
Milan Frank Matetich	2nd #6	Guest	Injured
Michelle Lynn Swenson	2nd #7	Guest	Dead
Greg James Swenson	2nd #7	Guest	Dead
William Joseph Nelson	2nd #8	Employee	Injured
Bruce Wayne Kellerhuis	2nd #9	Guest	Left at 3:30 a.m.
Brian Jay Porter	2nd #9	Guest	Dead
Robert William Reed	2nd #10	Employee	Escaped
Glen Ray Wittman	3rd West BR	Guest	Injured
Thomas Fredrick Cooley	3rd Spare BR	Guest	Dead
Charlette Geraldine Ekroot	3rd Master BR	Owner	Injured
Gladys Lillian Merril	3rd Center West BR	Owner's Mother	Dead
Duane Anderson	Cabin	Guest	Injured

FIRE SPREAD

Due to the extensive fire damage and the almost complete destruction of all structural members, fire patterns were virtually impossible to observe and physical evidence was almost nonexistent. This lack of physical evidence and observable patterns means that the investigation must center around witness statements and any available fire modeling or empirical data available. The investigation is continuing at the time of this report and the cause has not yet been determined. However, witness accounts suggest that the fire originated on the first floor, possibly in the dining room area. Fire development was fast and overwhelmed occupants as they lay sleeping on all three floors.

It was further determined from witness statements that there was no early warning from smoke detectors; in fact there is no witness who states they heard a smoke detector at any time during the fire.

The vertical openings in the structure certainly contributed to the rapid spread of the fire from the first floor to the third floor. There was little to stop the spread of fire and toxic smoke. In addition, the lack of early warning contributed to the spread as it may have gone unnoticed for a period of time before discovery.

ESCAPE ROUTES AND OCCUPANT ACTIONS

One of the owners, Vince Ekroot, died in the fire. He was confined to the first floor due to a handicap that left him in a wheelchair. There was no indication of an attempted escape.

The ten rooms on the second floor, at the time of the fire, were occupied by four lodge employees and five guests. Three of the guests and one employee died in the fire. Two employees and one guest were able to jump from second floor windows, and one employee and one guest were able to escape using the interior building stairway before it became impassible. Two of the three persons who jumped were injured and one of the two using the stairs was injured while attempting to escape.

Four of the five bedrooms on the third floor were occupied at the time of the fire by Charlette Ekroot (owner), Charlette's mother, Gladys Merril, and two guests. Two of the four died in the fire, the other two were seriously injured jumping from the windows.

CODE IN EFFECT WHEN LODGE WAS BUILT

The building code in effect at the time of construction was the 1973 Uniform Building Code. The building code in this area of Minnesota is enforced by the Cook County Building Department.

The Windigo Lodge was the last inspected by the State Fire Marshal Division in 1988 and was on a 3-year inspection cycle. There had reportedly been extensive remodeling done to the building after this inspection.

SMOKE DETECTOR PERFORMANCE

There were reportedly single station, battery-operated smoke detectors on the first and second floors of the lodge. It is uncertain but most likely they were not there. The witness statements said the only smoke detector in the building was located on the first floor near the bar.

LESSONS LEARNED

1. The choice of early warning detection systems must be adequate for the type of occupancv.

The presence and operation of fire alarm equipment in this incident such as smoke detectors are somewhat in doubt. The smoke detectors were to have consisted of single station, battery-operated detectors One witness stated he heard an alarm -- however, he believed it to be an alarm clock. Most of the survivors were awakened by other residents.

The usefulness of alarm devices not electrically powered, electronically supervised, or interconnected for this type of occupancy should be seriously questioned. Single station smoke detectors have value in single family residential settings where the detectors are meant to alert occupants of fire conditions in their immediate area. However, fire alarm systems provide a much higher level of fire safety over single station detectors in this application due to audibility concerns, maintenance and lack of other fire protection features in the structure. In this particular case there are doubts as to whether the single station detectors were re-installed following the recent remodeling.

2. Open stairways are almost always a factor in the spread of smoke and fire: alternate, protected exits must be provided.

Unprotected vertical openings, three or more stories, were certainly a factor in the spread of fire and loss of life in this fire. Unfortunately the same openings which allowed the vertical spread of heat and smoke were used as exits and contributed to the delay or impediment of egress from the building.

3. Code requirements must be complied with: lack of code-required compartmentation contributed to the outcome of this fire.

Based on the State Building Code in effect at the time of construction, a l-hour occupancy separation should have been provided between the assembly area (main floor) and the sleeping/residential areas (upper floors) of this structure. This may have provided additional time and provided a protected exit system for the building's occupants had it been coupled with an early warning alarm system.

4. Evacuation plans and procedures should be practiced by employees and supplied to quests in anv hotel. motel or guest lodge facility.

Based on the transient nature of the resort community, having an established plan that is practiced by employees and posted for guests is a vital necessity for this industry.

5. Decorative elements. such as the exposed ceiling beams in this case, require that specia1 efforts be made to insure the fire-resistive integrity of the construction.

It was stated the ceiling construction on the first floor was sheet rock with exposed beams. However, there were indications from witnesses and photos that the sheet rock had large gaps where it met at the beams. This allowed fire to travel to the floor construction above and probably contributed significantly to the fire spread.

6. Facilities serving the public located in rural areas at a distance from fire and EMS services should take extraordinary responsibility themselves for fire and life safety.

Dependence upon a fire service organization for immediate fire and life safety protection in this application is not practical. The most efficient and effective fire and life safety protection can only be provided by the facility itself. Ensuring the building is built properly and meets fire and life safety codes such as early warning detection systems, exiting, enclosure of vertical openings, compartmentation and perhaps sprinklers is the beginning for providing protection for guests in this type of occupancy. Further, given the wilderness area in which Windigo Lodge was located, better first aid and fire fighting equipment, and the proper maintenance and training of employees in its use, are essential.

Without the proper precautions for fire and life safety, even if a fire department had been located as close as five minutes from this structure, it is questionable whether it would have been able to positively affect the outcome of this incident.

Responsibility for one’s own safety is also paramount for self protection. Recognizing safe conditions in buildings and not taking the risk of frequenting establishments without solid fire and life safety features would go a long way in ensuring personal survival.

United States Fire Administration

Technical Report Series

Four Firefighters Killed, Trapped by Floor Collapse Brackenridge, Pennsylvania

Federal Emergency Management Agency

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National Fire Data Center

Four Firefighters Killed, Trapped by Floor Collapse Brackenridge, Pennsylvania (December 20, 1991)

Investigated by: J. Gordon Routley

This is Report 061 of the Major Fires Investigation Project conducted by TriData Corporation under contract EMW-90-C-3338 to the United States Fire Administration, Federal Emergency Management Agency.

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Four Firefighters Killed, Trapped by Floor Collapse Brackenridge, Pennsylvania

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OVERVIEW

Four volunteer firefighters died when they were trapped by a partial floor collapse during a structure fire in Brackenridge, Pennsylvania, on the morning of December 20, 1991. All four were members of a mutual aid truck company that had responded to the early morning incident and were assigned to prevent fire extension from the basement to the ground floor of a 2-story building. Although they were wearing full protective clothing and using self-contained breathing apparatus, it appears that they were overwhelmed by the severe fire conditions that erupted when a section of the ground floor collapsed into the basement. The collapse cut off their primary escape path, and the fire burned through their hose line, leaving them without protection from the flames. (Appendix **A** presents the Timeline of Events leading up to the floor collapse.)

SUMMARY OF KEY ISSUES	
Issues	**Comments**
Situation	Fire in enclosed room in basement. Unable to locate fire because of smoke. Smoke and heat increasing, but no visible fire.
Structure	Appeared to be heavy concrete construction. Actually thin concrete floors supported by unprotected steel.
Contents	Furniture refinishing business. Quantities of flammable finishes and solvents in basement.
Exits	One entrance/exit on each level; no alternate exits.
Structural Collapse	Floor section collapsed between interior crew and their only exit. Fire overwhelmed crew.
Rescue Attempts	Valiant rescue efforts proved unsuccessful. Unsure if missing members fell into basement or were trapped on ground floor.
Incident Command	No formal command system or personnel accountability in place. Chief of first-due company in command of incident; Assistant Chiefs assigned to basement and ground floor.
Information	No pre-fire plan and no detailed knowledge of occupancy. Clues of structural danger not recognized as fire conditions increased
Communications	Radio system inadequate for current needs.
Response	Independent volunteer companies. Mutual aid requested on arrival and additional companies called in succession.
Weather	Extremely cold night, predawn hours. Problems with frozen hydrants.
Water System	Weak supply. Extensive mutual aid and long relays needed to protect exposures.

The firefighters who died were all members of the Hilltop Hose Company. They were:

Name	*Age*
Michael Cielicki Burns	27
David Emmanuelson	29
Rick Frantz	23
Frank Veri, Jr.	31

The analysis of this incident provides several valuable lessons for the fire service. Unfortunately these are all revisited lessons, not new discoveries. These firefighters died in the line of duty, while conducting operations that appeared to be routine, and were unaware of the situation that was developing below them. They died in spite of the fact that they were experienced, they were operating with a standard approach to operational safety, and they were the object of repeated rescue attempts by highly capable comrades.

There are several factors that could have provided warning or changed the outcome of this situation. Like most accidents, this situation was the result of a number of problems that came together under the worst possible circumstances. Firefighting obviously involves inherent dangers that must be accepted by its practitioners. The important messages for the fire service are to identify risk factors in advance of an incident and to develop mechanisms to react appropriately when critical situations present themselves.

This situation bears distinct similarities to other incidents that have claimed the lives of several firefighters in the past. The lessons that must be derived from this incident are not a condemnation of the actions or judgment of anyone who was involved in the situation; they simply identify information that can help to prevent this type of accident from occurring in the future.

FIRE SERVICE ORGANIZATION

Brackenridge is a community of approximately 4,500 population, located approximately 25 miles northeast of Pittsburgh, next to the Allegheny River. It is protected by the Pioneer Hose Company, which operates two stations, necessitated by railroad tracks that divide the community. (See Appendix B for area map.) Each station is equipped with a pumper (E50 and E51) and an equipment truck (R50 and R51). A

van is also provided at Station 50 to transport additional personnel, designated as Squad 50.

The all-volunteer company has approximately 30 active firefighting members, supported by a large contingent of auxiliary, support, and inactive members. An elected Fire Chief and two Assistant Chiefs are responsible for command functions and the line officers include a Captain and several Lieutenants.

Station 50 is located on Morgan Street, one block from the river front. Station 51 is also located on Morgan Street, on the opposite side of the railroad tracks. The fire building is in the downtown part of the community, at the intersection of Brackenridge Avenue and Morgan Street, within 150 feet of Station 50. (For area map see Appendix B.)

The surrounding area comprises several contiguous boroughs and townships, protected entirely by volunteer fire companies. The companies protecting neighboring Tarentum Borough include the Highland Hose Company and the Eureka Hose Company. Highland (Company 11) operates primarily as a truck company, although their ladder truck was out of service for a major rehabilitation at the time of the incident. The primary truck company tools had been transferred to Special Service Unit SS115 while the ladder truck was gone. This company also operates a pumper to provide for water supply.

Eureka Hose (Company 12) operates as the primary rescue and ambulance company for the area. In addition to a rescue-pumper (E121), this company operates a heavy rescue truck, a squirt/hose wagon, and two ambulances. Career employees maintain Advanced Life Support ambulance service during weekdays, when volunteer staffing is limited.

The Tarentum Police Department dispatches the Tarentum and Brackenridge fire companies and additional companies in surrounding townships.

Harrison Township adjoins Brackenridge to the north and east and is served by three volunteer companies, all dispatched by the Harrison Police Department. Hilltop Hose Company of Natrona Heights operates a pumper (E31), an 85-foot ladder-tower quint (T33), an equipment truck (U34), and a personnel carrier (S32). Hilltop was designated to provide truck company service for Brackenridge while Tarentum's ladder truck was out of service. The travel distance from the Hilltop station to the fire location is approximately one mile.

Citizen's Hose Company provides ambulance and engine company service to Harrison Township. Harrison Hills Hose Company provides an additional engine company, while a fourth company was recently withdrawn from service.

The communities are located near the intersection of four different counties and mutual aid is available from all surrounding jurisdictions. There are several hundred volunteer companies in the counties surrounding Pittsburgh, each with strong company identity and local community relationship. Each volunteer company operates autonomously within its designated first due area and the Chief of that particular company is the ranking authority for fire and rescue operations.

The Allegheny County Fire Marshal is responsible for fire cause determination and investigations throughout the county. The Fire Marshal's Office is organized within the County Police Department and has no authority for fire suppression, although most of the staff members are active within volunteer companies. Building and fire codes are adopted and enforced by the local jurisdictions. Some volunteer companies are involved in limited fire code inspection activities, where codes have been adopted by their local jurisdictions.

The Fire Marshal is also responsible for the County's Emergency Management functions. Within the scope of emergency management, Allegheny County Public Works has resources to assist the volunteer organizations with specialized equipment for major incidents. These resources are provided by county employees as an additional service of the County.

FIRE BUILDING

The fire building was located in the downtown area of Brackenridge, in an area of mixed residential and commercial occupancies, two blocks from the Allegheny River. Most of the structures in the immediate area are two stories in height, and the fire building was one of the larger structures in the immediate area, although much larger industrial buildings are located only a few blocks away. The water supply in the area is limited to between 750 and 1,000 gallons per minute.

The building was two stories in height, approximately 65 feet wide by 75 feet deep, with a full basement. (See Appendices C and D for Floor Plans and Structure Diagrams.) The vertical distance between floors was approximately 12 feet and the ground floor at the front of the building was even with the sidewalk level. The ground slopes down toward the river

and at the rear of the building the basement is approximately half above grade level. A rear driveway slopes down to a roll-up garage door providing vehicle access to the basement.

At one time the building served as an automobile dealership and an interior ramp allowed vehicles to be driven to the second floor. A roll-up garage door on the front of the building provided access to the ramp. An additional roll-up door, inside the building, provided access from the bottom of the ramp into the main portion of the ground floor, which served as the showroom.

Construction details indicate that the ramp was not part of the original construction. The upper floor was originally used as a roller skating arena and became part of the automobile dealership at a later date. When the ramp was installed, the stairs to the second floor were removed, leaving the ramp as the only access to the upper level. An enclosed stairway, near the center of the building, connected the basement and the ground floor.

A set of renovation plans, dated 1980, indicated a set of double exit doors discharging from the ground floor level at the rear of the building. (This may have been the original exit discharge from the upper floor.) These doors were located in the corner, under the automobile ramp and could only be reached by walking under the ramp through an area with low overhead clearance. When a change of occupancy occurred, the exterior exhaust shaft for the basement spray booths was installed directly in front of these doors, permanently eliminating this exit.

The residential building to the rear is an architectural match for the fire building and a bridge once connected the two buildings to provide access to the owner's apartment. Two steel beams still spanned the rear driveway, connecting the ground floor of the fire building with the second floor of the building at the rear. The bridge and the door that provided access to it were removed in an earlier renovation.

There were no exterior stairs or fire escapes, and the building contained no fire alarm, detection, or sprinkler systems. The only exterior access to the ground floor was at the front of the building and the only exterior access to the basement was at the rear. An interior stairway near the center of the building linked the basement and ground levels.

The basement foundation walls were concrete, and the exterior walls above were brick over terracotta tile construction. A portion of the basement was separated from the main area by brick walls to serve as a

boiler room, although it was no longer used in this capacity. Natural gas and electric heating units had replaced the old central furnace at some point in the building's history.

The floors were concrete; the first floor surface was finished with terrazzo and tile in different areas and the upper floor surface had been covered with wood.

OCCUPANCY

The building housed West Interior Services, a company that specialized in restoration and refinishing of furniture. The front part of the ground floor had been converted to offices and the large showroom windows had been replaced by smaller window assemblies. The ramp to the second floor remained in place and the upper level was used for storage.

All of the company's production facilities were located in the basement. A stripping operation was located toward the rear, with three dip vats containing solvents and neutralizers that were used to remove old finishes from wood furniture. Thermostatically controlled immersion heaters were installed to keep the contents of the vats at their proper temperatures.

A 30' x 30' finishing room was constructed in the front part of the basement to provide a clean environment to apply finishes and to contain flammable vapors. Two spray booths were installed in this area and were vented to the exterior by an exhaust system. The exhaust duct carried spray vapors to the rear of the building and extended up the exterior to discharge at the roof level. An additional exhaust fan was installed at the rear exterior of the building to move the exhausted vapors up to the point of discharge.

The finishing room walls were constructed of gypsum wallboard on wood studs, framed into the building structure. Air intake filters were installed in one of the walls to provide for make-up air when the spray booth exhaust system was operating. A set of double doors allowed for large pieces of furniture to be moved into and out of the finishing room.

Shelves inside the finishing room were provided for finishing products, primarily in one gallon and five gallon metal containers, including lacquers and lacquer thinners. A considerable quantity of aerosol containers of touch-up and special finish materials was kept on a set of

shelves in one corner of the room. Other materials used in the finishing process were stored on shelves and cabinets in the room.

A self-closing rag container was provided in the room. An area just outside the double doors was provided for 35 and 55 gallon drums of flammable liquids, which were connected to a grounding system. Liquids from these containers were dispensed into smaller containers for use in the finishing room and in other areas. Several other drums containing flammable and non-flammable products were stored in the basement and in an exterior storage area at the bottom of the rear driveway.

The remainder of the basement was used for woodworking and storage. A rack in one corner was used to store lumber for repair jobs. The area between the finishing room and the roll-up door was used as a shipping and receiving area where finished jobs were staged for shipment and newly arrived pieces were unloaded. The entire basement was cluttered with woodworking equipment, work in progress, materials in transit, and miscellaneous storage.

THE FIRE

The fire originated in the basement finishing room, which is directly below the front entrance. The investigation indicates that the cause was most likely an accumulation of over-spray residue that was ignited by the electric heating unit. The alternative possibility of spontaneous ignition of chemicals used in the room could not be eliminated. The actual time of ignition is believed to have been as long as several hours before discovery. Investigators believe that the fire may have smoldered for several hours and may have gone through repeated stages of flaming and smoldering combustion, limited by the ventilation that was available to sustain flaming combustion.

Between midnight and 0100 hours neighbors had reported a strong odor of smoke in the area and members of the Pioneer Hose Company, who were at the station, had looked for a source, concluding that it was coming from a wood stove. The temperature was approximately 100F, with no wind, and many wood stoves were in use in the neighborhood. One witness later reported that visible smoke had been coming from either the chimney or the basement exhaust duct, but this was not observed by the firefighters who checked the area.

Around 0200 hours another call was received by the Communication Center and a police car was sent to check the area, but the officer found nothing unusual.

The fire was discovered by the first employee reporting for work, on the morning of December 20, 1991. The employee discovered smoke immediately upon opening the front door, then went to the rear and observed smoke in the basement. The employee knocked on the door of the residential building to the rear and asked a resident to call the Fire Department. The Tarentum Police Dispatch Center received the call at 0545 hours, reporting smoke in the building.

INITIAL RESPONSE

The Tarentum dispatcher activated the tones to notify Pioneer members of the alarm at 0546 hours. The Pioneer Chief, who lives less than a block from the scene, was first to arrive and reported "smoke showing" at 0547. He immediately requested the response of Hilltop Hose Company for their ladder truck. This request was relayed from the Tarentum dispatcher to the Harrison dispatcher and the company's tones were activated at 0549.

One of the first Pioneer firefighters to arrive at the station dressed in full protective clothing picked up an SCBA and a forcible entry tool, and responded to the front of the fire building on foot. At this time light smoke was coming from the front door, which had been opened by the employee. As the firefighter stopped inside the doorway to don the SCBA facepiece he noted that the floor was hot to touch with a gloved hand and through the kneepads of his turnout pants. He concluded that the fire must be in the basement and went around to meet the crew that was arriving with Engine 50.

The Fire Chief directed Engine 50 to lay a 5-inch supply line from the hydrant next to the station to the fire building. This was done as soon as sufficient members had arrived to respond with an engine company crew. Engine 51 was responding from the other station and arrived slightly after Engine 50. The Fire Chief directed Engine 51 to lay an additional 5-inch supply line from a hydrant in their direction of approach. As Engine 51 arrived, one of the crew members noted heavy smoke coming from the chimney at the rear and suspected that the problem could be a chimney fire. Additional members responded on the rescue trucks from each station at 0553 hours.

INTERIOR OPERATIONS

Engine 50's crew opened the rear door and extended a 2-inch attack line down the five steps into the basement. They encountered moderate smoke and heat, but no visible fire. They were able to walk upright and

navigate with handlights, although their vision was extremely limited by the smoke. The line was advanced approximately 50 feet into the basement as they worked their way around the stripping vats and furniture.

Hilltop's Truck 33 was en route with a seven member crew and was requesting approach directions from the Pioneer Chief by 0555 hours. Truck 33 was directed to the front of the fire building and was on the scene by 0559 hours. The crew included the Hilltop Assistant Chief and the Company's 2nd Lieutenant, who were brothers, and five additional members. The Hilltop Chief responded on Engine 31 with a six member crew approximately three minutes behind the ladder truck.

Pioneer's two Assistant Chiefs (C5 and C53) also arrived at the front of the building and conferred with their Chief. One of the Assistant Chiefs (C53) assumed responsibility for interior operations on the ground floor and made an entry, with the building owner, to unlock doors. The owner, who had responded from his home, was a former volunteer fire-fighter and reported that he was able to enter and briefly walk around on the ground floor at that time (between 0555 and 0600), although the smoke was a strong respiratory irritant.

On arrival, Truck 33 was requested to provide an interior entry team for the ground floor. The Lieutenant and three firefighters donned the four SCBAs that are carried on the truck and reported to C53 at the front door. Before entering, the Lieutenant and the Hilltop Assistant Chief switched their portable radios to a tactical radio channel because of the heavy traffic on the main channel. This placed them on a separate channel from the other units on the scene of the fire.

The entry team advanced a 2-inch attack line to the interior, accompanied by two crew members from E51, to search for signs of fire. The remaining members of Truck 33's crew remained outside and were joined by Engine 31's crew. The Pioneer Chief assigned them to perform ventilation by breaking a window on the second floor at the front of the building. At this point (approximately 0605 hours) arriving members noted a considerable amount of smoke coming from all openings in the building, although it did not appear to be particularly hot or thick.

The other Pioneer Assistant Chief (C5) assumed responsibility for operations at the rear of the fire building. When he surveyed conditions from the basement door, he was concerned with the increasing smoke conditions and the fact that the attack line crew could not locate the fire. He was also concerned with crew accountability and had some difficulty

making contact with Captain 50, who was inside the basement trying to open the overhead door. Attempts to open the roll-up door for ventilation were unsuccessful. He directed the crew to back the line out of the basement until ventilation could be accomplished.

MUTUAL AID

The Eureka and Highland Hose Companies were requested for mutual aid at 0600 and 0601 respectively. Eureka's Engine 121 was requested to provide a water supply for Engine 50, when it was found that their hydrant was inoperative. A medic unit had already been requested from Eureka to stand by at the scene. The second request brought five members on Engine 121, followed by four members on the Rescue Truck and Eureka's Chief.

Engine 121 was assigned to extend Engine 50's line to another hydrant. This hydrant was also found to be inoperative, and the line had to be extended 400 feet to a third hydrant to finally obtain a water supply. This was completed at 0617 hours, 30 minutes after the first unit arrived at the scene.

Engine 51 also had problems with their supply line and had to shut down their hydrant to reconnect the 1/4 turn coupling that disengaged from the pumper when the line was charged. Although both pumps had problems with their supply lines, they were able to charge the attack lines with tank water and both had corrected the problems before any of the attack line crews encountered the fire.

Highland's Special Service 115 was requested to provide additional truck company capability and responded with seven members. At 0611 hours C5 requested the SS115 crew to assist with forcible entry on the roll-up door at the rear of the building. (Appendix E lists the fire companies involved in this incident.)

CHANGING CONDITIONS

By the time the Highland crew was requested to cut the door, the smoke conditions in the basement had begun to change significantly. C5 advised the Fire Chief (C50) at 0611 hours that the fire in the basement was becoming more serious and that the basement looked as if it might "light up." He was planning to cut the roll-up door to accomplish ventilation of the basement.

Two minutes later, at 0613, C5 advised C50 that he could hear the fire building up in the basement. He had entered the basement and could hear the sounds of crackling and popping, indicating that a significant fire was burning somewhere in the basement. Heavy smoke was now coming from basement openings and ventilation was needed. Crackling noises and muffled explosions could be heard, and the smoke was becoming hotter and darker. The smoke movement suggested that backdraft conditions could be developing within the basement.

Members from SS115, who were bringing a saw to the rear to begin cutting the door, noted smoke pushing from the joint at the intersection of the front wall and the sidewalk. Crew members who crawled into the basement, after cutting the bottom panel out of the roll-up door, encountered elevated temperatures when they attempted to stand up inside.

At 0618 C5 again advised the Chief of the need for ventilation and reported that he was reassigning the attack crew to take out the basement windows on the Morgan Street side of the building. The first four windows opened into the boiler room and, when they were broken, only moderate smoke was released. The fifth window was the only one that opened into the main part of the basement and when it was broken a heavy volume of hot black smoke was released.

At the front of the building, at this time, the volume of smoke was increasing, but it was still relatively light in color and lazy in movement. There was no indication of visible fire. The Pioneer Chief discussed the need for vertical ventilation with the Hilltop Chief and instead requested that Hilltop's members break out additional windows on the upper floor at the front and side. Hilltop's members split into two crews and positioned ground ladders on the front and side of the building to accomplish this task. Electrical power lines required extra caution in positioning of the ground ladders.

The crew members from Hilltop T33 (the four men who are to die in this fire) had advanced their line in through the front door to the open area near the top of the basement stairs, and the Pioneer Assistant Chief (C53) went outside to obtain the key to the stairway door from the business owner. He returned and unlocked the door, but it was hot to the touch and smoke was issuing from under and around it. He directed the crew to hold their position in the open area and to look out for vertical extension of the fire, while he went back outside to confer with the Fire Chief.

With the heavy volume of smoke coming from the basement window, C5 determined that the best direction of attack would probably be via the basement stairs, using a positive pressure ventilation fan to keep the stairs clear and to push the smoke and heat out through the basement windows and the overhead door. One of the crew members was sent to determine the location of the stairs and the ability to advance a line by that route.

FIRE ATTACK

At approximately 0620 hours, the Eureka Rescue crew and the members who had completed the supply line for Engine 50 walked up to the rear of the building and encountered the SS115 crew still attempting to cut through the rear roll-up door. Some of the members began to assist with cutting the door, while others obtained a 1 3/4-inch attack line from E50. The attack line was advanced under the door and fire was immediately visible along the wall to the left of the doorway and toward the corner where the finishing room was located. The line was advanced into the basement as the crew attempted to knock down the visible fire. At approximately 0623 hours, this was the first sign of visible fire and the first application of water on the fire.

The fire conditions at this point suggest that the fire had finally broken out of the finishing room, possibly due to a failure of its enclosure wall. The Eureka members worked their way into the basement, but could not knock down the heavy volume of fire in the far comer with the flow from their 1 3/4-inch line. The Eureka Chief directed the crew to back out and sent other members to obtain a large line and a portable master stream to place in the doorway. Two attempts to contact the Pioneer Fire Chief by radio were unsuccessful.

FLOOR COLLAPSE

At the front door, the Assistant Chief (C53) was just coming out as he passed the firefighter who was entering to locate the stairs. The firefighter took one step inside the front door and began to sink as the floor began to collapse into the basement. He was pulled to safety by the Assistant Chief as the floor dropped away. In an instant the interior erupted in a rush of smoke, followed by a ball of fire, blowing out the doorway and shattering the ground floor front windows.

The eruption pushed the firefighters into the street and knocked several others off their feet. As they looked back toward the doorway they could see the 2-inch hose line rupture as it was enveloped by fire. Heavy

fire continued to pour from the basement and out through the front openings at street level.

As the floor collapsed there was only enough time for someone to shout “Get ‘em out!” over the radio. There was no contact with the four Truck 33 crew members. Some members realized immediately that firefighters could be trapped inside and additional hose lines were quickly advanced and operated into the doorway, but they could not suppress the fire. There was no possibility to advance lines into the building -- the floor was completely gone across the entire front of the building.

There was no rear exit on the first floor, so the only way the T33 members could have gotten out of the building would have been to go down the stairs and out the door at the rear of the basement.

There was some initial confusion over the number of members who were missing and their specific identities. Hilltop members knew that they had four crew members inside, but only three were immediately identified. The identity of the fourth member had to be determined by reconstructing who had seen whom on the truck and donning SCBA prior to entering the building. Pioneer members had been in and out of the building and there was no system in place to rapidly determine who had responded or where they were on the incident scene at the time of the collapse. The Pioneer Officers had to account for all of their members to confirm that all were out of the building.

The word spread rapidly that at least three members were missing and were believed to have fallen into the basement inferno. It was approximately 30 minutes before the actual number and their identities were confirmed.

While the situation was obvious to everyone at the front of the building, the crews operating at the side and rear were unaware of the critical situation for several minutes. While the ground shook and the building erupted in flames at the front, the only change that was evident in the other areas was a brief “push” of smoke followed by a significant increase in smoke and heat conditions. The Eureka crew that was backing out with the 1 3/4-inch line was still in the basement and its members were unaware of the collapse. The members who were working on the roll-up door now had hot heavy black smoke coming out through their opening.

RESCUE ATTEMPTS

An estimated ten minutes elapsed before it was known to the crews at the rear that a collapse had occurred and that members were believed to have fallen into the basement. The Eureka crew organized an entry team to attempt a rescue while the portable deluge was used to attack the fire in the basement. The entry team advanced a hose line through the basement to the point where they encountered collapsed steel and concrete, but could find no sign of the missing members. Based on the report that the Hilltop crew had last been seen near the top of the stairs, they advanced the line up to the stairway landing. A member worked his way to the top of the stairs and reached out to search for victims, but the visibility was almost zero and there was no sign of the missing crew.

Two more rescue attempts were made by the Eureka crew and one by a Pioneer crew, in each case looking for the missing members in the basement rubble and from the top of the stairs. The upper floors of the building were becoming heavily involved in fire and the members could feel the vibrations as sections of the upper floor and roof collapsed.

The final attempt was made more than an hour after the floor collapse occurred and involved a Eureka rescue team using lifelines. From the top of the stairway, two members worked their way out to the edge of the collapse area and looked for signs of the missing members, but still found no sign of them. To reach the stairs they had to wade through water above the tops of their boots, feeling their way to avoid obstructions. As they worked their way out, they discovered the stripper solvent tanks that were overflowing into the flooded basement and several drums that were overturned or ruptured. The entire crew had to be decontaminated in the freezing temperatures and were then transported back to their station. After this attempt, all rescue efforts were suspended until the fire could be brought under control.

CONTINUED FIRE SUPPRESSION

After the collapse, the upper floors of the fire building were rapidly involved in fire. The ramp opening allowed the fire to fully involve the storage area on the second floor and the wood roof structure. Most of the first floor was also consumed by the flames. Exposure protection soon became critical, particularly to the wood frame residence on “Side 4.” Additional mutual aid companies were summoned and master streams were placed into operation to confine the fire.

To supply the master streams, large diameter hose lines were stretched to the river front, where a pumper was placed to draft, and to hydrants several blocks away. Water was obtained from the Tarentum water system and from the private system at a steel plant within the limits of Brackenridge. As the building was consumed, some of the exterior brick walls began to fail, bringing down the electrical power lines that ran along the front and side of the structure. The resulting power failure disabled the major pumps supplying the Brackenridge water system and more mutual aid companies had to be called to further supplement the water supply. A tanker shuttle was also used to supplement the water supply for a period of time.

The fire consumed the entire roof and second floor levels, continuing to expose neighboring structures until mid-morning. As the structure collapsed inward, elevated master streams were able to bring the flames under control. In the crowded area where the fire occurred, there was a significant risk of fire spread to other structures around the burning structure and most of the fire suppression effort was directed to exposure protection.

BODY RECOVERY

After the last rescue attempt, it was finally recognized that there was no hope of finding the missing firefighters alive. They had either fallen into the roaring inferno of the basement or they were still somewhere on the part of the first floor that remained standing, but the entire building had been heavily involved in fire for more than two hours. Heavy equipment was needed to move rubble to search for the bodies.

The Allegheny County Fire Marshal assumed responsibility for the investigation and County Public Works equipment was brought in to move the debris. A “gradall” was used to pull out the portions of the front wall that were still standing and to dig into the rubble. It was only at this point that an assessment of the floor collapse could be made and it could be seen that only the very front portion had fallen into the basement.

The bodies were located almost six hours after the collapse occurred. All four bodies were found together, approximately 35 feet inside the front door, in the same area where they had last been in contact with the Assistant Chief. The floor in this area did not collapse, but the bodies were almost covered by debris that had fallen as the building burned. One member still held the nozzle and another had an axe; a portable radio and a handlight were found with the bodies.

It appears that the four were immediately overwhelmed by the fire erupting from the basement, and they had no opportunity to take any action. Most of their protective equipment was destroyed, but examination of the recovered components and autopsy reports indicate that all were wearing full protective clothing and using their SCBAs when they were overcome. There was no indication of any inhalation of smoke or superheated gases.

As an example of the degree of destruction, all that remained of an SCBA cylinder was a blob of melted aluminum attached to the steel cylinder valve. The glass fibre reinforcement filaments maintained the shape of the cylinder. Although two of the SCBAs had PASS units, no sound of PASS alarms was heard by anyone outside or during the rescue attempts. The only sound that was heard was one member who reported hearing a low pressure alarm bell on an SCBA, minutes after the collapse.

CONSTRUCTION DETAILS

The floors and roof of the fire building were supported by a frame of unprotected steel members. The side walls of the building were load bearing, as indicated by pilasters that were visible on the Morgan Street side of the building. (This detail was not evident on the opposite wall, which did not have facing brick, since it was not a street face.) Steel beams spanned the width of the building at four locations, dividing the structure into 5 bays of approximately 15 foot depth.

The massive roof girders (30” x 12”) appear to have been unsupported across the entire 65 foot width of the building. The roof girders were steel I-sections, fabricated from plate and angle components that were riveted to form the desired shapes, reflecting the structural steel technology of the period. The wood roof imposed a lighter load than the combination of cars and concrete on the floors, making the broad span feasible.

The floors were supported by steel beams and columns. The beams and columns were arranged in four major support assemblies, spanning the width of the building at 15 foot intervals. The first support (closest to the front of the building) was made up of two beams, each spanning approximately 32 feet, supported by a single center column. The three remaining supports each had two columns, with a 32 foot center span and outer spans of approximately 15 feet on each side. The outer span beams were considerably smaller than the middle span beams, due to their shorter span and reduced load. The outer ends of the beams were solidly bricked

into the side walls, providing rigid anchorage at each end, and rigidly connected to the intermediate columns with bolts and brackets.

The majority of the structural steel was exposed. The only evidence of fire resistant protection for the steel frame was on the beams supporting the ground floor and provided an extra measure of fire resistance for these particular members only. The webs of the protected members had been encased in concrete, leaving the flanges and column connectors exposed. The concrete encasement appears to have been done after the original construction and the reason for it is not known. There were no provisions to anchor the concrete to the steel and the encasement on the first support fell off at some point in the structural collapse. The columns and the remainder of the beams were unprotected, although some were boxed-in by the construction of interior partition walls.

The most critical detail was the construction of the floor assemblies. The floors were supported by unprotected steel joists, approximately 14 feet 9 inches long, spaced on approximately 12 inch centers. The joists spanned the distance between the beams, and between the beams and the front and rear walls. They were fabricated of light gauge steel plates, channels, and angles, approximately l/8 inch thick, spot welded to form the desired shapes. The fabricated joists were I-sections, 10 inches tall with 2 l/2 inch wide flanges. These lightweight steel joists were extremely vulnerable to the heat of a fire.

The anchorages of some of the joists at the front of the building were severely corroded, particularly in the area under the door leading to the vehicle ramp. These particular joists were so severely corroded that they may not have been able to support a routine load.

The concrete floor slabs were only 2 l/4 inches thick, with approximately 3/8 inch thick topping of tile or terrazzo. The only reinforcing in the concrete appears to have been a steel mesh that was used to support the bottom of the slab when it was poured.

STRUCTURAL COLLAPSE

The primary structural collapse was caused by the failure of the steel joists supporting the floor slab above the finishing room. All of the joists between the front wall and the first set of support beams failed and dropped the concrete slab into the basement. Examination of the joists found in the rubble indicates that all were severely warped and twisted from heat exposure. The slab broke near the mid-point of the span and some sections were left hanging vertically from the beams. This created an

opening, directly over the fire, extending 15 feet in from the front for the full width of the building.

The middle column supporting the first set of beams was also buckled, although this appears to have been a secondary failure. The buckling of this column caused a secondary slab failure between the first and second sets of beams. The slab in the second bay sloped down toward the opening, with a low point at the center column, but did not drop into the basement. The remainder of the ground floor was not compromised.

The entire roof and most of the second floor collapsed into the rubble during the fire. The initial structural collapse involved only the one section of the first floor slab. The center column failed later, after severe fire exposure. The remaining beams and columns in the basement were not compromised, although most of the joists were warped and twisted.

Unprotected steel is particularly vulnerable to fire exposure. Structural steel loses most of its strength between l,0000 and 1,4000°F and the endurance of a particular member is directly related to its mass, the load on the member, and the temperature of the fire environment.

The mass determines the time it will take for a member to be heated to its failure temperature when exposed to a fire. Light gauge members, such as the floor joists in this building, may be vulnerable to collapse with as little as three to five minutes of direct exposure to a fire, while heavier members may take 10 to 20 minutes to reach their failure temperature. Very heavy steel members may survive extended exposure to a fire environment.

The method of attachment of the joists is also very significant. Unrestrained members tend to elongate, while rigidly restrained members will warp or twist. The light steel joists were fully restrained at the outer end and were supported by a much heavier beam at the interior supports. When heated, they would tend to warp and twist, but they would probably remain connected to the floor slab and to the end supports. An assembly, such as the combined system of floor joists supporting the concrete floor slab, will tend to act together and will have a longer fire endurance than the individual members until the whole assembly reaches a point of failure.

The steel joists above the finishing room were directly exposed to fire for a long period of time. The hot floor condition was noted by the first firefighters entering the building, approximately 35 minutes before the collapse occurred, and it is possible that the fire had been burning in the finishing room for an extended period of time before being discovered.

The individual joists were probably heated to the point of failure well before the collapse occurred; probably before the Fire Department arrived. They did not collapse immediately, because they were supported by the rigidity of the combined joist and slab assembly and the manner of support at the basement wall.

The failure may have been initiated by any one of several causes. The concrete slab may have been heated enough to fracture from internal stresses or a minor backdraft in the basement could have caused it to lift slightly and then drop back. The corroded joist ends may have failed first, resulting in a "domino effect" collapse across the front of the structure, or the first movement of the buckling column could have fractured the slab and triggered a total failure of the floor section. Any of these sources could have initiated the failure. The critical point is that the failure could have occurred at any time, before or after, the arrival of the Fire Department.

LESSONS LEARNED

1. An effective ore-fire planning program should cover all major structures in the communitv. even those that appear to be of fire resistive construction.

The critical details of construction that made this structure vulnerable to collapse should be recognizable to individuals who have studied the hazards of building construction. The fact that unprotected steel construction is extremely vulnerable to rapid failure under fire exposure should be clearly understood by all firefighters. The recognition of this type of construction is much more difficult while a fire is in progress than during inspection or pre-fire planning visits.

Most individuals who were familiar with the building had the impression that it was heavy-duty solid construction, particularly since it had been used as an auto dealership and supported the weight of cars. Witnesses referred to the weight of 14-inch thick concrete floors in describing the soundness of the structure. Even the building owner believed that it was fire resistive construction and employees at the scene were quoted as referring to the "heavy duty" floor construction.

For code purposes, this building would have been classified as "unprotected non-combustible" construction. It had no fire resistance and should have been considered vulnerable to collapse from any significant fire exposure. (It should also be noted that automobiles are considered to be a relatively light load for design purposes.)

The extremely limited access/exit conditions should also have been noted in pre-fire planning. The only access to the ground floor was at the front, and the only access to the basement was at the rear. Access to the second floor was limited to the ramp. The firefighters on the ground floor had no alternate exit path. These are critical factors that should be incorporated into a plan that can be used by the Incident Commander to make critical strategic decisions during a fire.

Due to the fact that the building was so close to the fire station and was one of the major structures in the community, several members were familiar with it in a general sense. Unfortunately, it had not been pre-fire planned and evaluated in a manner that identified its inherent weaknesses. This is a case where working from perceptions resulted in a very false sense of security.

An effective pre-fire planning program involves critically examining buildings to identify fire risks and protection factors. This information must be documented and recorded in a systematic manner, so that it can be used for training and to support the development of a safe strategic plan during a real incident.

The investigation also revealed that the fire building had several possible violations of the Fire Prevention Code adopted by the Borough of Brackenridge in 1981. The enforcing authority for this code would have been the Borough; and it is not clear if this responsibility had been delegated to the Fire Department, either formally or informally. One of the objectives of a fire code is to identify and cause correction of situations that could pose a danger to firefighters during fire suppression operations. Fire code enforcement activities and pre-fire planning should be coordinated.

2. The need for standard operating procedures for incident management is particularly great in areas where there are numerous autonomous fire companies.

While some of the basic elements of an incident management system were employed at this incident, there was not a clearly defined and documented system to develop a strategic plan and to effectively manage resources, particularly where several different companies are involved in the operation.

An area that encompasses numerous autonomous jurisdictional units has a particular need for standard operating procedures to manage incidents. The incident management system must be applied in a

consistent manner to effectively integrate the efforts of mutual aid companies and, particularly, to provide for operational safety.

Three essential elements of an incident management system are command organization, personnel accountability, and information management.

Command Organization -- The role of the Pioneer Fire Chief as the Incident Commander and the assignment of the two Assistant Chiefs as Sector or Division Officers followed an established plan for that department and was considered a normal procedure for the companies that respond with them. Their roles were determined among themselves, however, and their assignments were not clearly identifiable, particularly to other companies arriving at the scene.

There was no standard terminology to define their roles or to identify their assignments, visibly or over the radio. Part of an effective incident management system is the ability to clearly identify who is responsible for a particular aspect of the incident.

There was no structured plan to utilize command officers from assisting companies in the incident command organization or to delegate identified roles to other qualified individuals.

Personnel Accountability -- Many volunteer departments have difficulty accounting for who is at the scene, where they fit into the organization, and what they are assigned to be doing. Every member at the scene should be assigned to a particular function within a supervisory chain of command. Supervisors should be able to immediately account for the location and function of every individual or unit within their span of control. Freelance operations are extremely dangerous.

Information Management -- A complex incident involves the processing of a large amount of information under stressful conditions. The Incident Commander must be able to gather and process information in a manner that supports the development of a plan and the continuing management of the incident. This particularly involves separating critical information from distractions that can prevent the Incident Commander from identifying key factors and making important decisions. The incident management system must include a component to record and process information, which could range in complexity from a clipboard to record critical information, to an aide assigned to manage and record information for the Incident Commander, to a designated planning function with maps,

pre-fire plans, and similar capabilities, possibly including on-scene computer capabilities.

3 . Fireground information must be effectively communicated and processed to formulate a Risk Assessment and Attack Plan.

This is a particular example of a situation where the nature and extent of the fire were not clearly identified, and the Incident Commander had great difficulty developing a plan to deal with the situation. Units were on the scene for over 30 minutes, with an obvious working fire somewhere in the building, before any water was applied to the fire. While several clues were present to suggest the location and growing magnitude of the fire, the information did not come back to the Incident Commander in a manner that supported an effective risk assessment or the development of an operational plan.

These same factors have been identified in several previous incidents that resulted in multiple firefighter deaths. In most of these cases, crews were working in areas where conditions appeared to be "routine" and non-threatening, unaware of critical factors that were occurring around them.

Analysis of an incident can make critical observations and factors obvious, after the fact. In this incident several factors were noted by different individuals *(hot floor, increasing smoke and heat in the basement, smoke pushing out between the wall and sidewalk, crackling and popping noises).* The important lesson is to be able to make these observations, identify their critical nature, communicate the information in an effective manner, and process the information in a manner that causes the hazards to be recognized. This type of information must be communicated and must be used to develop and revise the operational plan for the incident.

The "20 minute rule" is often used as a guideline in making an assessment of structural conditions. This "rule" is based on the body of experience which suggests that an "ordinary construction" building (non-fire resistive) should be considered vulnerable to structural collapse after 20 minutes of fire involvement. The rule is based on generalized experience and has many exceptions. *In the case of unprotected steel construction this could be an overly generous time allowance, while it would be extremely conservative for fire resistive construction.*

4. An effective communications system is an essential tool of a modern fire department.

The inadequacies of the existing communications system are evident in the analysis of this incident. Several communities in this part of Allegheny County share a common primary radio frequency. Both the Tarentum and Harrison dispatch bases and several other communities use this one frequency to dispatch volunteer fire and ambulance companies. The same frequency is used for dispatch tones, communications between individual units and the dispatcher, communications between the incident commander and the dispatcher, and on-scene tactical communications. It is not uncommon for a base station to override on-scene communications at an incident. Only one alternate tactical channel is available and it is not commonly used. In addition, there are no mutual aid or tactical channels that will accommodate units from all four of the intersecting counties. There is an obvious need for designated and coordinated tactical channels that can be used by all of the companies responding to an incident.

At this incident, the Hilltop interior crew switched to the tactical channel, because of the heavy traffic on the primary channel. This restricted their ability to communicate with anyone except their own chief officers, who were engaged in other activities, and cut them off from radio communication with the Incident Commander or the officer responsible for their assigned area. They were also unaware of the reports coming from anyone else at the incident scene that could have given an indication of the situation that was developing. If an evacuation order had been given, they would have had to depend on someone to repeat the order over the tactical channel.

It is extremely important to maintain communications with all units on the fireground, particularly units assigned to interior positions. This may require multiple channels and the assignment of units to different channels must be coordinated as part of the incident management system. AI1 tactical communications must be monitored by designated individuals in the command structure.

The dispatchers at both Tarentum and Harrison are primarily police dispatchers and the fire department function is a secondary role (although some of the individual dispatchers are volunteer firefighters and are well oriented toward this role). Each location operates with a single person on duty who must handle both police and fire radio channels and telephone communications for multiple jurisdictions. While this arrangement may work adequately in routine situations, it does not provide the level of support that is needed to effectively manage a major incident.

There is an obvious need for a total evaluation of the communications capability for the fire service in this area.

CONCLUSION

It is a sad reality that the four volunteer firefighters who died in this incident were operating in full compliance with written standard operating procedures and safety guidelines adopted by their company. Their performance appears to have been fully reasonable and standard under the circumstances. They were operating together, as a crew, with a company officer, under an assigned command officer. They were using full protective clothing and self-contained breathing apparatus. They had a portable radio, lights, tools, and a charged hose line. They died "by the book," in spite of the exemplary efforts of rescue teams who risked their own lives trying to save their fellow firefighters.

The lessons that should come from this incident should not reflect negatively on any individual. They are important lessons for the "system" --- lessons that can help the fire service avoid future tragedies.

United States Fire Administration

Technical Report Series

Floor Collapse Claims Two Firefighters
Pittston, Pennsylvania

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

United States Fire Administration Fire Investigations Program

The United States Fire Administmtion develops reports on selected major fires throughout the country. The fires usually involve multiple deaths or a large loss of property. But the primary criterion for deciding to do a report is whether it will result in significant "lessons learned." In some cases these lessons bring to light new knowledge about fire - the effect of building construction or contents, human behavior in fire, etc In other cases, the lessons are not new but are serious enough to higlight once again, with yet anofher fire tragedy

The reports are sent to fire magazines and are distributed at national and regional meetings. The Internatioal Association of Fire Chief assists USFA in disseminating the findings throughout the fire service. On a continuing basis the reports are available on request from USFA; announcements of their availability are published widely in fire journals and newsletters.

This body of work provides detailed information on the nature of the fire problem for policymakers who must decide on allocations of resources between fire and other pressing problems, and within the fire service to improve codes and code enforcement, training, public fire education, building technology, and other related areas.

The Fire Administration, which has no regulatory authority, sends an experienced fire investigator into a community after a major incident only after having conferred with the local fire authorities to insure that USFA's assistance and presence would be supportive and would in no way interfere with any review of the incident they are themselves conducting. The intent is not to arrive during the event or even immediately after, but rather after the dust settles, so that a complete and objective review of all the important aspects of the incident can be made. Local authorities review USFA's report while it is in draft. The USFA investigator or team is available to local authorities should they wish to request technical assistance for their own investigation.

'This report and its recommendations were developed by USFA staff and by TriData Corporation, Arlington, Virginia, its staff and consultants, who are under contract to assist the Fire Administration in carryying out the Fire Reports Programm.

The United States Fire Admintration greatly appreciates the cooperation received the Pittston Fire Department, with special thanks to Chief Louis Calabrese, Assistant Chief James Rooney, and Assitant Chief Frank Roman for the information and assistance they provided.

For additional copies of this report write to the United States Fire Administration, National Fire Data Center, 16825 South Seton Avenue, Emmitsburg Maryland 21727.

Floor Collapse Claims Two Firefighters
Pittston, Pennsylvania
(March 15,1993)

Investigated by: J. Gordon Routley

This is Report 073 of the Major Fires Investigation Project conducted by TriData Corporation under contract EMW-90-C-3338 to the United States Fire Administration, Federal Emergency Management Agency.

Federal Emergency Management Agency

United States Fire Administration

National Fire Data Center

Floor Collapse Claims
Two Firefighters
Pittston, Pennsylvania

Investigated by: **J. Gordon Routley**

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OVERVIEW

Two volunteer firefighters were killed in the early morning hours of Monday, March 15, 1993 in the town of Pittston, Pennsylvania. The two firefighters, who were members of separate departments, were operating as a team on a hose line, attempting to locate a concealed fire, when a sudden and unanticipated floor collapse sent them crashing down into an inaccessible combustible concealed space. Even though both were wearing full protective clothing, using self-contained breathing apparatus, and operating with the protection of a handline, they were unable to escape from the building or find refuge from the rapidly advancing fire conditions. Rescue teams were unable to reach the victims due to difficult access and rapid fire spread throughout the fire building and interconnected structures.

The two firefighters who died were Captain John F. Lombardo of the Pittston Fire Department, age 26, a six year fire service veteran, and Assistant Foremen Leonard lnsalaco II of the West Pittston Fire Department, age 20, a two year fire service veteran.

SUMMARY OF KEY ISSUES	
Issues	**Comments**
Situation	Fire in a concealed space below the ground floor level. Crews had difficulty locating the fire in the complicated structure.
Structural Collapse	Floor collapsed, dropping two firefighters into fire area, moments after flames were located.
Rescue Efforts	Rescue efforts were unsuccessful due to lack of direct access to fire area and rapid fire spread throughout structure and exposure.
Fire Control	Entire complex of interconnected structures became involved. Elevated master streams were used to confine and control fire.
Building Condition	Structures were more than 100 years old, with numerous renovations, changes of occupancy, interconnections, and previous major fire. No pre-fire plan information available.
Accountability	Identity and number of missing members in doubt due to lack of accountability system. Entry crew had PASS units, but no radio communications. Crews were assembled at the scene from personnel who responded.
Access to Fire Area	No access from occupancy above to fire area below. Only access was through vacant occupancy on lower level with entry from street at rear.
Communications	Radio system is inadequate for the needs of the fire department. Entry crews did not have portable radios to communicate with Incident Commander.
Pre-fire Plan	No pre-fire plan was available to assist the Fire Chief in directing operations. The complicated buildings presented unique problems that could not be visualized without a plan.

The purpose of this report is to provide educational information for the fire service, with the hope that future accidents of a similar nature may be avoided. It is not intended to find fault with the actions of any individual who was involved in the operations or to fix responsibility for the fire or the deaths that resulted.

The review of this incident will note several lessons learned as a result of this tragedy, many of which are similar to the observations from previous incidents. It is the intent of this report to provide an educational basis from which these lessons can be learned by the fire service, so that it can better prepare and equip itself for future missions.

There is an inherent level of risk that will always be present in the operations of a fire department at the scene of any emergency incident. Through training, education, and experience, fire service members can be better prepared to anticipate the outcome of all types of incidents and to react to the circumstances that they are presented with in each situation. The officer in command of a fire must be able to identify the risk factors that are present in a given incident and formulate a strategic plan that takes all of those risk factors into consideration. The fire service must also be prepared to react to unexpected situations and conditions.

The firefighters who died in this incident were trained and experienced and were operating in what they considered to be a normal situation with a normal approach to operational safety. The experience of this incident should be carefully considered by every firefighter and particularly by present and future incident commanders.

FIRE SERVICE ORGANIZATION

Pittston is a community of approximately 9,500 people located 10 miles south of Scranton, Pennsylvania on the east edge of the Susquehanna River. Fire protection is provided by the Pittston Fire Department, which is comprised of two separate volunteer companies, Eagle Hose Company No. 1 and Niagara Engine Company No. 2. Pittston City employs seven career personnel; the Fire Chief, two Assistant Chiefs, and four drivers. The Fire Chief has overall authority and responsibility for all operations and the Pittston City owns the apparatus.

The Department is directly supported by the city from property tax revenue. The volunteer firefighters receive no compensation and there is no operational distinction between the two companies at the scene of a fire; all members operate under the direction of the City Fire Chief and the two Assistant Chiefs. The single fire station belongs to one of the

volunteer companies but is staffed by the career personnel. Even though the community is suffering from severe economic conditions, the volunteer organizations are reported to be very stable. The volunteer companies have invested several million dollars of revenue from the Pennsylvania Fireman's Relief Fund which is used to purchase safety equipment and to provide for the health and welfare of the members and their families. This is exemplified by the recent purchase of 40 sets of new turnout gear and the use of state-of-the-art self-contained breathing apparatus and personal alarms (PASS devices).

The Pittston Fire Department operates two Class A engines and an elevated platform aerial device. A vehicle equipped with spill control material is shared by the police and fire departments and is housed at the combination city hall and police station, approximately two blocks from the fire station. Emergency Medical Services are provided. by an independent volunteer rescue squad with its own station.

The volunteer fire companies have about 100 members of which an estimated 40 to 50 are active firefighters. The minimum career staffing is two personnel on duty at all times, with the workload shared evenly by all seven employees. Volunteer members are hired as part-time employees on an as needed basis to cover for absent career personnel or supplement the staffing due to unusual conditions that might exist.

The normal response to structure fires is to have the on-duty career personnel respond to the scene with the two pumpers, accompanied by any volunteers who happen to be at the station. Alarms are dispatched by the Pittston Police Department and all personnel are alerted via radio receivers. The volunteer and off duty career personnel normally respond directly to the scene to meet the apparatus. There are no predesignated crews and it is up to the officer in command to organize the arriving personnel into operational teams.

The neighboring volunteer departments in West Pittston, Exeter, Jenkins Township, and Duryea provide mutual aid to Pittston on request of the incident commander. The career departments in the cities of Scranton and Wilkes Barre, located north and south respectively, are also available on mutual aid. Additional assistance can be requested from other volunteer departments in Luzerne County.

During the 36 hour period prior to the fire a heavy snowfall, with strong winds and bitter cold, had paralyzed the community. Snow removal crews had begun to clear the streets, but most were limited to a single lane and many hydrants were buried in snow.

On the night of the fire the Fire Chief had exercised his authority to hire two volunteers as part-time employees to increase the crew at the station from two personnel to four. The Chief felt that due to the severe snow conditions the extra personnel would be needed to assist the drivers with their routine duties of hydrant spotting, layout, and possibly digging hydrants out of the snow banks caused by drifting and plowing.

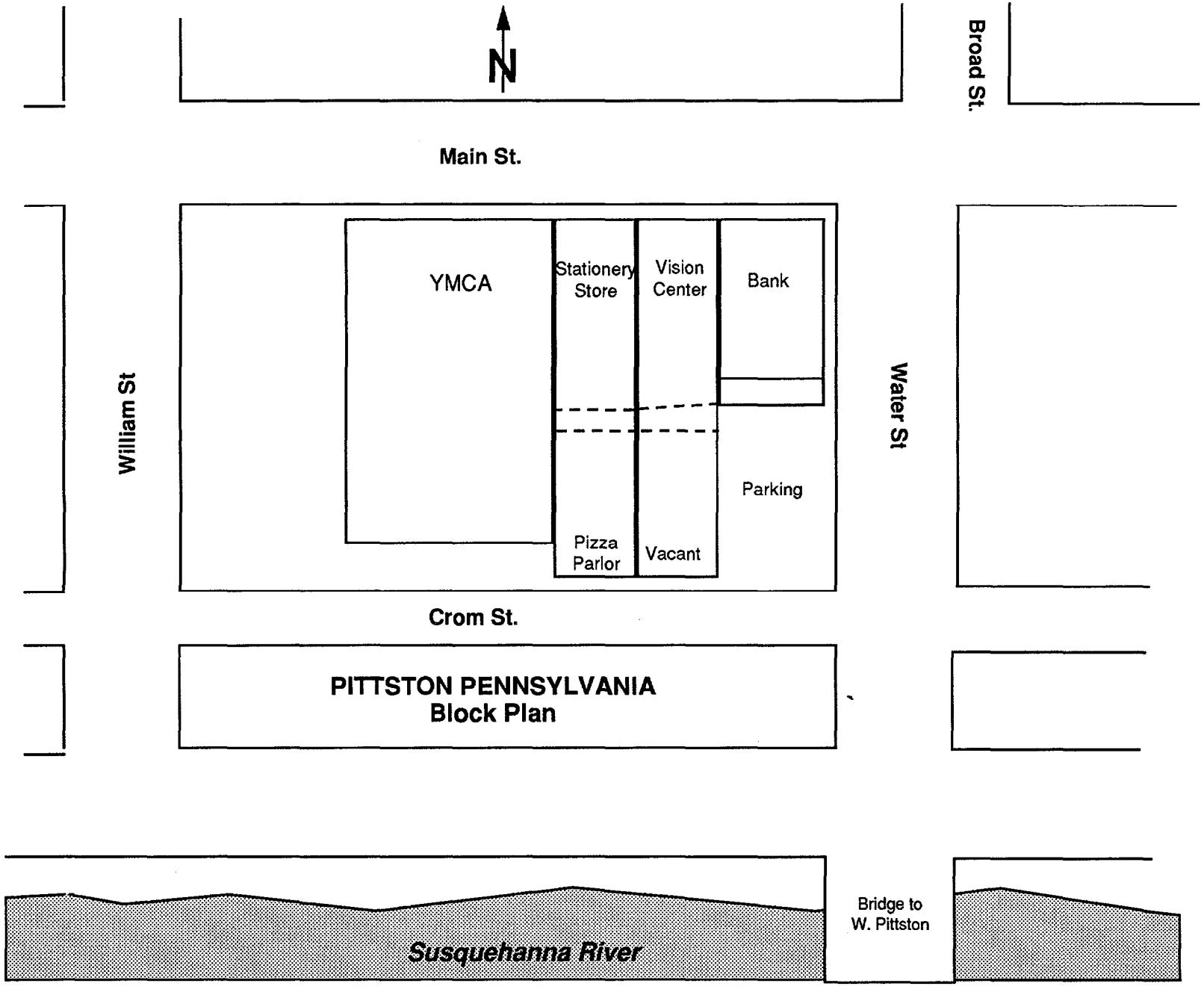
The fire station is located approximately two blocks from the fire scene, adjacent to the main business district, where the fire building was located. All three major pieces of apparatus operated by the department are located at this station. There is no command post vehicle provided for the chief officers to utilize and they therefore are required to rely on their personal vehicle for response to the fireground. This shortage severely limits the resources that are available to the incident commander in his responsibility to manage this or any incident.

FIRE BUILDING

The fire occurred in a complex of buildings in the crowded central commercial district of Pittston, fronting on North Main Street. The complex was comprised of four original structures that had been interconnected over the years.[1] (The block plan, ground floor plan with demensions, and a cross section diagram appear on the following pages.) At the front there were two single story storefront occupancies, an optical service establishment and a stationery store. At the rear there were entrances to a pizza parlor and a vacant office space, opening onto Crom Street, each with a story above. Due to the differences in elevation from Main Street to Crom Street, the street level facing Main Street coincided with the upper level at the rear of the buildings. The street level entrances at the rear were approximately level with the basement at the front of the buildings.

The four original structures appeared to be more than 100 years old and had been altered many times over the years. At the front the two original structures were three or possibly four stories in height, but the upper floors had been removed after a fire that is believed to have occurred in the 1950s. The buildings were essentially twins and appeared to have been constructed together. They had thick brick outer walls and a pair of back-to-back double course brick walls extending from front to rear, physically separating the structures into two separate buildings. Their

[1] No detailed plans could be located for the fire buildings, so all descriptions are taken from verbal descriptions and visual examination of the rubble.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Block Plan
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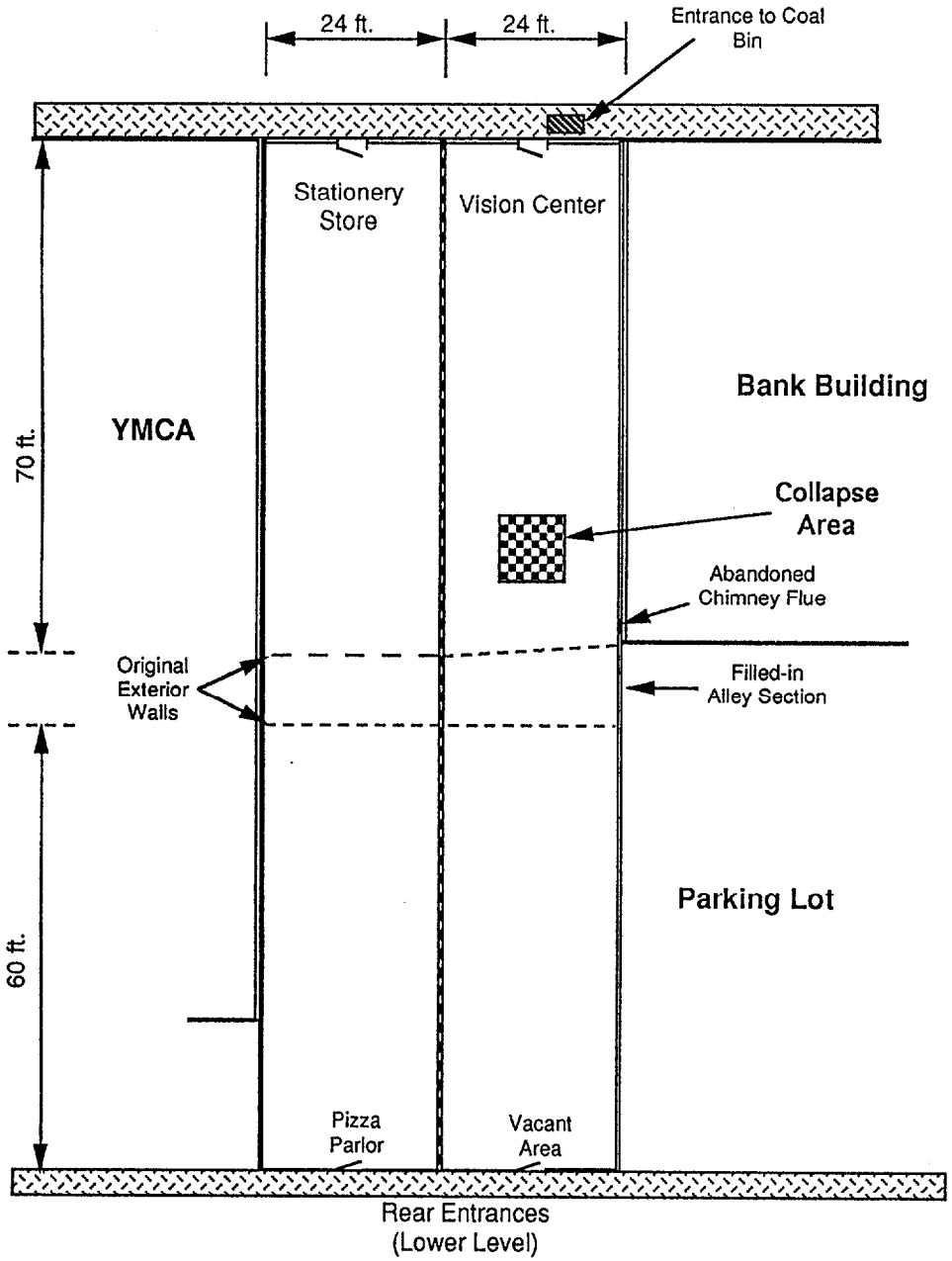
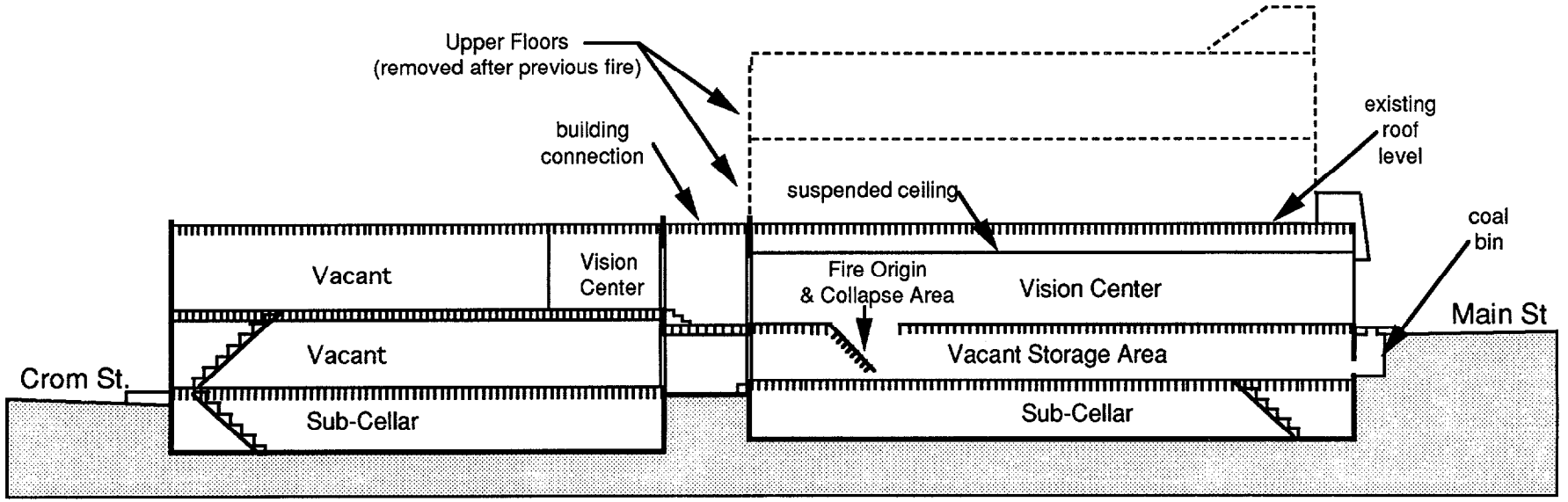
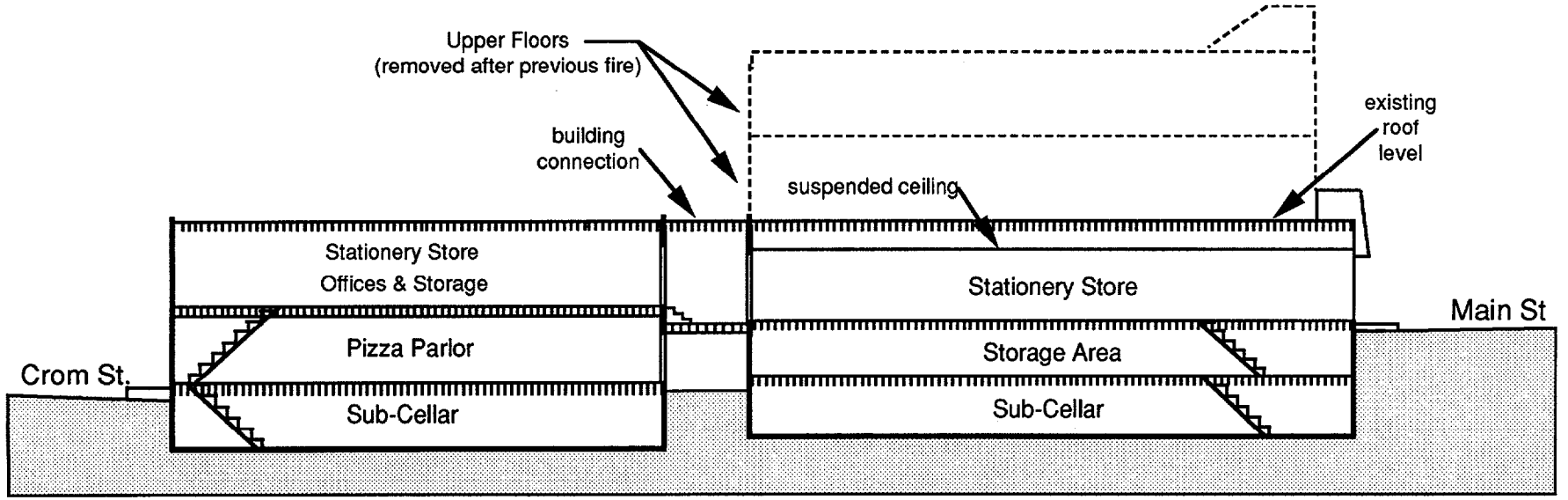


ESTIMATED DIMENSIONS





PITTSTON, PENNSYLVANIA
Cross Sections through Occupancies

narrow width appears to have been a detail necessitated by the construction method, since the floors and roof were supported by heavy wood joists spanning approximately 25 feet between the brick walls. The upper levels had included a public assembly occupancy that is reported to have extended through both buildings and there was evidence of several openings at the ground level that had existed at one time or another as the occupancy of the buildings changed.

Below the street level of these buildings was a basement level. The ground floors were wood supported by exposed 3 x 10 wood joists spanning the width between the brick walls under each occupancy. The clear height of this space was reported to be too short for normal occupancy, but it was used for storage. Under the vision center this space had been partially finished, but was unoccupied. Below the basement levels there were unfinished sub-cellars.

The rear occupancies were originally individual structures, separated from the front buildings by an alley. The rear buildings also may have been twins and the construction details were similar to the front buildings. These structures had street level entrances from Crom Street with a cellar below and a story above.

At some point the alley between the two structures was closed and built over, linking the front and rear structures. The rear walls of the original buildings became interior walls and a new section was built, linking the street level at the front with the upper floor of the rear structure, and the street level at the rear with the basements of the front buildings. The cellars did not connect, as there was no cellar space where the alley had been.

It is believed that the interiors of the two buildings were altered numerous times over the years as the occupancies changed. The stationery store extended back into the upper level of the structure behind it and the vision center occupied part of the space on the upper floor of its rear building. A pizza parlor was located in the lower rear occupancy, under the rear of the stationery store, and was operated by a relative of the stationery store owner. The two levels were linked by a stairway that connected the rear of the stationery store with the pizza parlor. The stationery store also had an access stair leading to the storage area under the main part of the store.

The rest rooms for the pizza parlor were new construction, built into the space that had been the alley connection between the two buildings, suggesting that there had been a large opening between the lower

occupancies at some time in the past. There was another large opening between the rear structures at the upper level that had been blocked by wood frame construction at some date over the years.

The ground floor space at the rear of the structure behind the vision center was vacant. It had been leased out for a variety of retail and office tenants over the years, but was vacant for at least a year before the fire. The only access to the area under the vision center was through this space, through a number of rooms and doorways. There was no stairway connecting the vision center with the level below.

The vision center extended into part of the upper level of the rear structure and used part of this space as a lab. There may have been an additional section at the rear of the upper level that was unused, with access from the vacant office space.

Special Risk Factors

The arrangement of the interconnected buildings created some very unusual and dangerous conditions for firefighters. From the vision center there was no access from the upper level to the lower level, except to go around to the rear of the building and enter from Crom Street, through the vacant office space. This also created dead end spaces on both levels, estimated at more than 140 feet from the street entrances on each level, where the only way out was the way a firefighter would have entered.

From the stationery store the only rear exit was the stairway down to the pizza parlor and out to Crom Street, which was a long and difficult path. Access to the basement storage level below the stationery store was available, but also very limited.

There were no openings for people to pass from the occupancies on one side of the center dividing wall to the other, but there were numerous openings where smoke or flames could extend through these walls. The false mansard front that had been built over the store fronts was an additional path for smoke travel or fire extension.

Finally, the aged condition of the buildings would have been a major concern. The wood joists were in questionable condition after more than 100 years in place and an unknown number of events, including at least one major fire that destroyed the upper floors.

While these occupancies were only two blocks from the fire station and most of the residents of Pittston had been in and out of them for

decades, the Fire Department did not have a pre-fire plan of the buildings and none of the members reported having an intimate knowledge of the interior arrangement or construction details.

Exposures

Exposures were not a major problem at this incident. The fire buildings were located between a two story bank building, estimated to be 40 years old, and a newer single story YMCA building. The exterior walls of both exposures were brick and concrete construction, abutting the exterior brick walls of the fire buildings. Both exposures had windowless walls, taller than the fire building. At the rear of the bank was an open parking lot. The front and rear exposures were streets, with single story occupancies across Main Street and a parking lot across Crom Street.

FIRE ORIGIN

The fire was determined to have originated in the vacant area under the vision center from a fault in an electrical conduit. The power supply for the vision center was run from the rear of the building to a panel on the ground floor at the front. The wires were enclosed in conduit that was attached to the underside of the wood joists supporting the ground floor. Although the power had been shut off to the vacant part of the building, this line was still energized to supply power for the occupancy above.

Due to the very cold weather over the weekend, the electrical heaters may have run continuously, causing an unusual current draw through the wires. The continuous current flow would cause the wires to overheat, particularly in an area where the conduit may have been damaged, even if the current was insufficient to blow a fuse or trip a circuit breaker. The overheating is believed to have been sufficient temperature to cause a smoldering ignition of one of the floor joists, approximately 60 feet back from the front of the structure.

The fire may have smoldered undetected for hours. The vacant area had an opening to an old chimney flue or vent stack in the exterior wall, which may have allowed the smoke to escape during the early stages of the fire. The downtown area was sparsely populated due to the snowfall that had started on the previous day, and even if someone had seen smoke coming from the stack it would have looked like smoke coming from a chimney.

The pizza parlor was open until 11 p.m. on the night of the fire. The owner reported that he left the building around 11:30 p.m. and noted nothing unusual.

A snow removal worker noticed smoke coming from the false front of the stores on Main Street at approximately midnight on March 15, 1993. He called in by radio to the public works dispatcher who turned in the alarm.

Response

The alarm was transmitted by the Pittston Police dispatcher at approximately midnigh? and the two pumpers immediately responded with the career driver and one volunteer firefighter on each vehicle. The other volunteers were alerted by radio and responded directly to the scene. Captain Lombardo, who lived only a few hundred feet from the scene, arrived at almost the same time as the first pumper, which had only a two block response.

Arriving at the scene they noted a moderate amount of lazy gray smoke coming from the eaves over the storefronts, suggesting a minor interior fire of some type. One pumper stopped at the front of the building, while the second pumper laid a supply line to it from the hydrant at Main and Water Streets. A 13/4 inch attack line was pulled as the arriving members dressed and prepared for entry.

The Fire Chief, who was at his residence, was unable to extricate his private vehicle from the snow to respond on the call. Another member of the department who was responding to the alarm picked him up and transported him to the scene. As they arrived they passed behind the fire buildings and noted no evidence of fire or smoke. The first indication of a fire noted by the Chief was the smoke coming from the false front over the storefronts.

Noting that there was a possibility of a working fire, the Chief instructed the dispatcher to request mutual aid from West Pittston. The West Pittston Volunteer Company responded to the scene from their station just a few blocks across the river. The West Pittston engine company laid a supply line to the front of the buildings from the opposite

[2] The times of the dispatch, arrival and subsequent events are estimated from witness accounts. There was no recording of the radio traffic or other specific time reference to establish a more accurate time sequence.

end of the block, while the ladder truck stopped at the rear on Crom Street (see diagram on following page).

Initial Entry

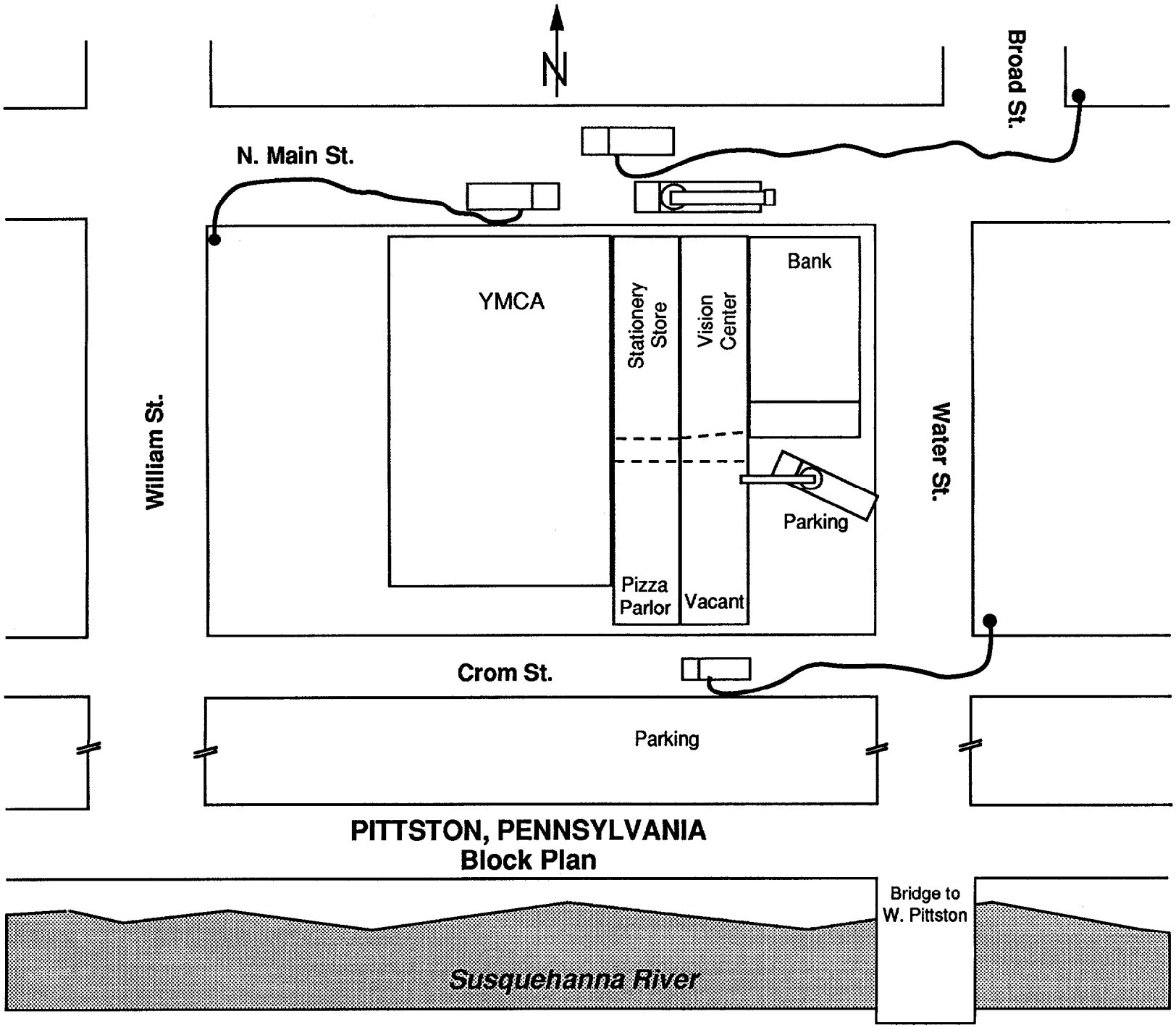
The initial entry was made into the stationery store, since it appeared to be smoke filled through the front windows. Forcible entry was made through the front door and glass was removed from the front windows, then the line was extended into the store, searching for the fire. The team, which included Captain Lombardo, wore full protective clothing and used self-contained breathing apparatus. They worked their way through the store, all the way to the rear, without encountering any sign of heat or fire. The line was then extended down the basement stairs, into the pizza parlor, and eventually all the way to the door on Crom Street. The interior team had no portable radio to report their progress back to the Fire Chief, but at the doorway they made contact with firefighters who had gone around to that side and reported that they could not find any sign of the fire.

The line was withdrawn back out to the front of the building where the first entry team had to change the cylinders on their breathing apparatus. Approximately a dozen Pittston firefighters were on the scene, along with a similar number from West Pittston. The amount of smoke coming from the buildings had increased, but still suggested a relatively minor interior fire. The Fire Chief believed that they would eventually locate a burning piece of furniture or some other easily controllable fire somewhere inside.

The Chief had directed one of the Assistant Chiefs to return to the station and to bring the aerial platform to the scene of the fire. The aerial platform vehicle was positioned in front of the fire buildings where it could be used to supply power for portable lights and fans. A ground ladder was raised and a crew went to the roof to evaluate the need for vertical ventilation. By this time, approximately thirty minutes after the initial alarm had been transmitted, the personnel on the West Pittston ladder truck had noted heavy smoke coming from the side of the building, near the point where the side wall intersected with the wall of the bank building. This is close to the area where the old chimney flue was located.

Second Entry

The determination was made that the fire must be in the vision center side of the buildings. The front windows of this occupancy were removed and forcible entry was made through the front door. Although it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Crom St.
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PITTSTON, PENNSYLVANIA
Block Plan
Bridge to W. Pittston
Susquehanna River

was also smoke filled, the smoke was not alarmingly heavy and the line was again extended inside by entry teams wearing full protective clothing and self-contained breathing apparatus.

The entry crews had some trouble navigating through the smoke filled office, but still reported finding no indications of the seat of the fire. One team used up their air supply and came outside. They were replaced by Lombardo and Insalaco, who had responded from West Pittston on the mutual aid request. Taking over the line they continued to search for the fire.

A second crew donned SCBA and followed the line into the building to back-up Lombardo and Insalaco. They reached the first team, but one of the team members of the second team was inexperienced, which caused him to become anxious working in the smoke filled interior. His partner escorted him back out to the front of the building, where they reported to the Fire Chief that Lombardo and Insalaco appeared to have located the fire in an interior room. This was estimated to be nearly an hour into the incident.

Another two member entry team was assembled and the members followed the line back where Lombardo and Insalaco were last seen. As they worked their way back they encountered much greater heat and came upon an area where flames were coming up through a large hole in the floor. The hose line appeared to extend into the crater and there was no sign of Lombardo or Insalaco. They quickly returned to the exterior to report their findings.

Rescue Attempted

By the time they reached the street it was obvious that fire conditions were changing rapidly. The smoke coming from the front of the building was hotter heavier and the crew on the roof reported that the heat and smoke issuing from their vent hole had increased rapidly. A second attack line was advanced into the building, but the crew could not reach the area where the floor had collapsed. The fire was rapidly involving the ground floor area and no access to the basement could be located.

One of the Assistant Chiefs took another crew around to the Crom Street side of the buildings and forced entry through the door into the vacant office space. A hose line was taken from the second Pittston engine through this door and extended back through the offices toward the front section of the building. Initially only light smoke was encountered, but as they reached deeper into the building they encountered heat and heavy

smoke that stopped further penetration. They were unable to reach the area under the front section of the building before they were forced to retreat from the building.

Defensive Operations

Fire was rapidly spreading through the vision center on the upper level and through the spaces below, and soon flames were visible in the stationery store. The situation became a defensive operation as the fire extended throughout the interconnected buildings. The aerial platform was set up in the front, and the West Pittston aerial ladder was set up in the rear parking lot to apply elevated master streams to protect the exposures. Additional mutual aid companies responded, but they were unable to prevent the total involvement and destruction of all four structures. The fire was confined to the complex of four structures and was brought under control by mid-morning.

Body Recovery

It was known almost immediately, when the floor collapse was discovered, that firefighters were missing, but the specific number and identities of the missing members was in doubt. There was no formal system for accounting for members on the scene, and the interior crews had rotated at least twice while searching for the fire. The two missing members had responded with two different companies and Insalaco was wearing a turnout coat labelled with the name of a third department and the rank of Assistant Chief, which added to the confusion. It was only by a process of elimination that the personnel at the scene were able to conclude that Lombardo and Insalaco were missing and presumed to have fallen into the basement.

By the time the fire was brought under control, the roofs, floors, and some of the walls had collapsed and additional sections of the ice encrusted brick walls were in danger of collapse. For most of the morning crews worked to try to find a way to penetrate the mass of rubble to search for the bodies of the missing firefighters. They eventually discovered an abandoned coal bin in front of the vision center, with a small access cover built into the sidewalk.

The Scranton Fire Department's rescue squad responded to the scene and, after a backhoe had been used to provide a larger access into the coal bin, its members were able to drop down and into the front part of the basement storage area. From there they had to tunnel back through the rubble more than sixty feet, handing debris out and passing shoring

materials in, before they finally discovered the two bodies. As assumed, the two firefighters had fallen through the floor into the void space and were trapped in the rubble of floor joists and furniture that had fallen through the hole with them. The bodies were carefully removed through the path that had been tunneled in from the coal bin and further exploration of the area confirmed that no additional members had been lost.

ANALYSIS

It appeared from the positions of the bodies and the furniture that had fallen on top of them that most of a room had dropped into the basement without warning. The other firefighters who had seen the fire reported that Lombardo and Insalaco appeared to be fighting a fire that was coming up around the baseboards of a room, well back inside the vision center, when they were last seen. Further investigation of the fire cause found that the probable point of ignition was in the same area where the collapse occurred, under the floor where the two firefighters were working.

The fire probably ignited one of the 3 x 10 wood floor joists and may have smoldered for hours before it was discovered. Large beams of this type have been known to bum for more than 24 hours before open flaming was observed. The electrical short could have ignited more than one joist or the fire may have spread at a slow rate in the very old wood.

The joists may also have been weakened by age and rotting, so that they could have been much weaker than one would expect from their appearance.

When the fire finally grew to a stage that significant amounts of smoke were produced, it was still contained by the solid wood decking over the floor joists. The crews spent an estimated 60 minutes searching for the fire without finding it, or even detecting a level of heat on the upper level that would have been alarming. By the time the fire became visible on the ground floor level, collapse was imminent.

The circumstances suggest that the collapse occurred totally without warning. Some of the personnel outside reported that they heard a loud cracking noise or a “pop” just before the heat and smoke conditions began to change rapidly. Within minutes the appearance of the situation changed from non-threatening to an obvious major fire.

There was no access from the ground level of the vision center to the space below. Although this space had been used by the previous occupant of the vision center for storage, the only way to check this area would have been to enter from the rear street, the way the rescue attempt was made.

Both firefighters were found to have been using their self-contained breathing apparatus at the time of the collapse and were properly attired in full protective clothing. While these items provided as much physical protection as is generally feasible for interior structural operations, it appears that they quickly succumbed to the combination of their fall and entrapment in the fire area. Examination of the personal protective clothing and equipment revealed no deficiencies.

At least one of the firefighters had a PASS device attached to his SCBA. It was impossible to determine from the damaged parts if it had been turned on or operated during the entrapment. No rescuers reported to have heard a PASS device operating.

LESSONS LEARNED

Several points need to be considered with respect to the way this fire presented itself and the actions that were taken by firefighters based on this information.

1. Command officers must consider the possibility that a fire which cannot be located is attacking the floor below the search teams.

One of the important lessons to be learned from this fire is the danger of a fire burning undetected below an area where firefighters are working. Several similar situations in the past have had similar consequences.

2. Officers must track the passage of time and assume a fire that cannot be located may be a mowing; threat.

The estimated time from arrival to collapse at this incident is one hour. For this entire period firefighters looked for a concealed fire that gave evidence that it was relatively minor. They continued to operate in a “minor fire” mode, despite the prolonged time without locating the source of the smoke. Officers must maintain an accurate awareness of the passage of time and, if the fire cannot be located, the assumption must be made that it is likely to become more serious.

3. Infrared heat scanning devices can provide valuable assistance in locating hidden fires.

A hand held infrared heat scanning device could have proven invaluable at this incident by helping the interior crews to quickly locate the hidden fire below the floor. These devices have been available for years and are reliable and relatively inexpensive.

4. Old buildings can be death trans.

Buildings that are old and have been renovated numerous times are often exceptionally dangerous to firefighters. They may have inaccessible void spaces, unknown paths where fire can build and spread without being detected, and openings where smoke can migrate to confuse firefighters who are looking for the fire's actual location. Regardless of general appearances, they may have major structural weaknesses that have developed over the years.

5. Pre-fire plans are essential for complex structures.

The complex of structures involved in this fire was extremely complicated and contained several features that should have been recognized as both problems and dangers to firefighters. These factors could only have been recognized through pre-fire visits and should have been recorded in a standard pre-fire plan format to support the officer in command of a fire at this location. It is interesting to note that most of the local firefighters were somewhat familiar with the buildings but not aware of the details of construction and arrangement.

6. Incident management procedures should be practiced and utilized at all fires.

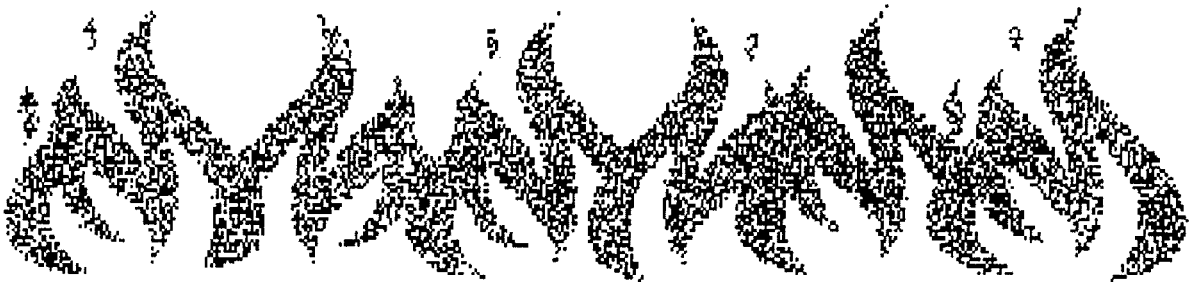
The direction of operations at this incident was conducted without the benefit of a standard incident management system or structure. The Fire Chief did not have the support of established systems to process information, analyze problems, supervise interior operations, communicate with interior crews, or support a complicated interior operation. The lack of a safety officer and the inability to communicate with interior crews were serious problems in this case.

7. A personnel accountability system should always be used, particularly at structure fires.

The establishment of effective accountability systems for all personnel operating at the scene of fires, particularly those working in interior operations, has become a standard safety practice. This type of system can greatly reduce the risk of overlooking personnel when a building must be evacuated. It also reduces the probability that personnel may become trapped or incapacitated and that no one would be aware that they were missing.

Note: *The similarities of this fire should be compared with the incident in Brackenridge, Pennsylvania in 1991 and the 14th Street Collapse in New York City in 1966; two fires that had similar circumstances and lessons learned and which claimed the lives of 16 firefighters.*

United States Fire Administration



Technical Report Series

Logan Valley Mall Fire
Altoona, Pennslyvania

Federal Emergency Management Agency

United States Fire Administration

United States Fire Administration Fire Investigations Program

The United States Fire Administration develops reports on selected major fires throughout the country. The fires usually involve multiple deaths or a large loss of property. But the primary criterion for deciding to do a report is whether it will result in significant "lessons learned." In some cases these lessons bring to light new knowledge about fire -- the effect of building construction or contents, human behavior in fire. etc. In other cases, the lessons are not new but are serious enough to highlight once again, with yet another fire tragedy report. In some cases, special reports are developed to discuss events, drills, or new technologies which are of interest to the fire service.

The reports are sent to fire magazines and are distributed at national and regional fire meetings. The International Association of Fire Chiefs assists USFA in disseminating the findings throughout the fire service. On a continuing basis the reports are available on request from USFA; announcements of their availability are published widely in fire journals and newsletters.

This body of work provides detailed information on the nature of the fire problem for policymakers who must decide on allocations of resources between fire and other pressing problems. and within the fire service to improve codes and code enforcement, training, public fire education, building technology, and other related areas.

The Fire Administration. which has no regulatory authority, sends an experienced fire investigator into a community after a major incident only after having conferred with the local fire authorities to insure that USFA's assistance and presence would be supportive and would in no way interfere with any review of the incident they are themselves conducting. The intent is not to arrive during the event or even immediately after, but rather after the dust settles, so that a complete and objective review of all the important aspects of the incident can be made. Local authorities review USFA's report while it is in draft. The USFA investigator or team is available to local authorities should they wish to request technical assistance for their own investigation.

This report and its recommendations were developed by USFA staff and by Varley-Campbell and Associates, Inc. and TriData Corporation, Arlington, Virginia, and its consultants, under contract to assist the Fire Administration in carrying out the Fire Reports Program.

The United States Fire Administration greatly appreciates the cooperation received from Chief Thomas Sral, Lakemont Fire Company; Joseph L. Lynch, Police Department Coordinator, Fire Coordinator, and Fire Marshal, Logan Township, Pennsylvania; and Trooper Jame J. Behe, Fire Investigator, Pennsylvania Sate Police, Hollidaysburg, Pennsylvania.

For additional copies of this report write to the United States Fire Administration, 16825 South Seton Avenue, Emmitsburg, Maryland 2 1727.

Logan Valley Mall
Altoona, Pennsylvania
December 16, 1994

Investigated by: Thomas H. Miller, P. E.

This is Report 085 of the Major Fires Investigation Project conducted by Varley-Campbell and Associates, Inc./JTriData Corporation under contract EMW-94-4423 to the United States Fire Administration, Federal Emergency Management Agency.

Federal Emergency Management Agency

United States Fire Administration

Logan Valley Mall

Plank Road and Goods Lane
Logan Township, Blair County
Altoona, Pennsylvania
Friday, December 16, 1994

Investigated by: Thomas H. Miller, P.E.

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OVERVIEW

An early morning fire on December 16, 1994 destroyed approximately 20 percent of the Logan Valley Mall, a regional shopping complex. An effective attack by 59 fire companies successfully controlled the fire although an additional 40 percent of the complex suffered severe smoke and water damage. The fire, which was reported at 2:29 a.m., completely destroyed 15 stores and 9 sales kiosks. The direct loss is estimated at $50 million, with total economic impact of more than $75 million.

The mall, which is located just outside Altoona, Pennsylvania, was built in several stages. It was partially protected by automatic sprinkler systems and partially by a 17-zone heat detection system. The portion that was destroyed did not have automatic sprinklers but the owners were planning to retrofit them. The first fire report came from a central alarm service indicating a fire alarm from the mall. The type and zone of alarm was not transmitted to the central station but was displayed on annunciator panels located outside the complex.

The successful control of this fire can be attributed to the large fire suppression force response and effective pre-incident planning. In the planning process the risk of a large fire in the unsprinklered parts of the complex was recognized; effective tactical approaches were incorporated in the plan. The availability of a strong water supply to support the numerous hose streams and master streams, as well as the automatic sprinkler systems, was also a significant factor.

SUMMARY OF KEY ISSUES

Issues	Comments
Fire Origin	Fire began in or near the rear of the largest store in the non-sprinklered part of the Mall.
Fire Spread	Combustible roof coverings over a corrugated metal deck contributed to rapid fire spread. Replacement of original combustible roof coverings did not eliminate the hazard.
Building Fire Protection	Partial sprinkler protection assisted in limiting fire spread. Heat detectors installed in the store of origin operated but did not prevent a large loss fire.
Pre-Incident Planning	Logan Township fire companies planned for a fire through the fourth alarm level and held multi-company drills. Drills included advancing lines and deluge sets into the covered mall area. Standardized training of firefighters helped companies who had never met or drilled together work effectively to overcome this major fire with minimal injuries. However, a concealed structural hazard, which was not a factor in this incident, was identified only after the fire.
Water Supply	A large fire requires a strong water supply. Public water mains, private mains, and a drafting source were adequate for the large volume of water used.
Large Diameter Hose	Firefighters made use of large diameter hose to supply elevated streams, deluge sets inside the building and fireground companies. This improved water delivery to the fire and reduced the time for doing so.
Multiple Alarms	With smoke showing on arrival, the Incident Commander requested additional alarms in accordance with pre-incident planning. This action allowed fire companies to arrive in time to mount a plan to defend at J. C. Penney and to cutoff the tire in the unsprinklered common mall as it traveled toward Sears. The fire rapidly involved fire companies beyond the scope of the pre-incident planning and this taxed radio communication with the dispatch center on the primary fire frequency. Use of the police radio frequency and later a cellular phone overcame this problem.
Covered Mall Separations	Stores with windows, glass doors, walls or other solid separations to the covered mall had less water and smoke damage than stores with open security grills or bars.

BUILDING HISTORY AND OCCUPANCY

The Logan Valley Mall is located in Logan Township, south of the city of Altoona in a commercial area that stretches north along Plank Road. It is near the intersection of Plank Road and limited access highway Route 220. There were no immediate exposures adjacent to the complex.

The Logan Valley Mall is a combination one- and two-story structure containing slightly more than 800,000 total square feet. The overall exterior dimensions were approximately 1600 feet (east-west direction) by 450 feet (north-south direction). At the time of the fire, it housed two anchor store tenants with the third anchor store vacant and over 100 additional tenants. For discussion purposes, the complex is divided into the East, Center and West Sections (See Appendix B, Figure 1). The fire started in and caused the most damage to the one story portion of the Center Section.

The original parts of the Mall were constructed as a shopping center around 1962. Various additions and renovations were constructed over the years. The common, covered mall between the original stores was added at a later date along with an addition containing stores around a common mall. The largest retail store tenant after the three anchor stores was the 37,000 square foot G. C. Murphy Store, which sold general merchandise. The Cinema IV, Thrift Drug, Crocodile Alley, and Wall to Wall Sound and Video were the next largest areas within the Mall; they ranged in size from 9,300 to 13,600 square feet. (See Appendix A for the complete list of tenants, area occupied, fire protection and fire damage.)

The parts of the East and Center Sections not protected by automatic sprinklers did have a central station monitored heat detection system. It was this system that activated and sounded the alarm which was relayed to the Logan Township Dispatch Center by ADT. Historically, the heat detection system generated a number of false or unwanted alarms. Companies were familiar with these alarms from the Mall and when the second alarm was requested, the Logan County Dispatch Center rebroadcast the alert to the first-due fire companies.

At the time of the fire, plans were being developed for another addition and a renovation which included plans for protecting the original sections with automatic sprinklers. The

G. C. Murphy Store, where the fire started, was one of the stores due to be protected with sprinklers.

At the time of the fire, automatic sprinklers protected the two active anchor stores (Sears at the east and J. C. Penney at the center). A third anchor store (Hess) located at the Mall's far west end, was also protected but had been recently vacated. All of the stores and the covered mall area in the West Section were also protected by automatic sprinklers. Automatic sprinklers were also provided in selected areas in the East Section. Besides Sears, these areas included the food court and other stores occupying an area that had previously been a grocery store. Sprinkler heads on this system, adjacent to the stores' entrance to the common mall operated during the fire.

The Logan Valley Mall is owned by Crown American Properties, L.P. with headquarters in Johnstown, Pennsylvania. The owner's property insurance is provided through the Factory Mutual System. Regular loss prevention inspections were provided by Factory Mutual Engineering who had made recommendations for providing automatic sprinklers throughout the complex. The Mall appeared to be well maintained and housekeeping was reportedly not a problem. Due to the time of year, storage and stock rooms were heavily loaded.

BUILDING CONSTRUCTION

The east half of the Logan Valley Mall was a one-story, noncombustible building and the west half is a two-story, noncombustible building. Roof construction was lightweight corrugated metal deck supported by steel bar joists resting on either unprotected steel beams and columns or on load bearing concrete block (typically S-inch) walls. Depth of steel bar joists varied from 16 to 24 inches. The floor to roof deck heights varied between sections of the complex, and between the covered mall and the tenant stores. The most common height within the tenant stores was approximately 18 feet and the covered mall roof was 6 to 8 feet higher.

Various styles and types of typically noncombustible suspended ceilings were provided below the roof bar joists. Most of the ceilings were either a 2x2 or 2x4 noncombustible tile in a metal grid. Some suspended ceilings were constructed of gypsum board using both metal and wood supports. Distances between these suspended ceilings and the roof deck varied from store to store in the range of 4 to 8 feet. Similar ceiling types and distances below bar joists were also

employed within the covered mall space. Minimal combustible construction materials were observed in the interstitial spaces above the ceiling and below the roof deck.

Many of the stock and storage rooms in the individual stores, as well as the common utility and mall operation& rooms, did not have ceilings. These spaces opened directly to the bottom of the corrugated steel roof deck, with storage using the full building height. Some stores constructed solid floor mezzanines in this space for improved access to storage. Where this arrangement was found, heat detectors were located both above and below the mezzanine. The walls between storage rooms and retail areas stopped slightly above the suspended ceiling level, allowing the storage areas to communicate directly into the space between the roof deck and the suspended ceiling.

The two-story west half had concrete floors poured over metal floor deck supported by unprotected steel bar joists resting on either unprotected steel beams and columns or on load bearing concrete block walls. In store sales areas, typically, a noncombustible suspended ceiling was provided. Light fixtures, HVAC diftusers, and other penetrations were usually not arranged to provide a fire resistance rated floor-ceiling construction.

Roof Deck

The roof covering over the metal roof deck in the area of the fire and adjacent to it contributed to the spread of the fire and the structural collapse. The Center Section was initially provided with a combustible built-up insulated roof covering which consisted of hot-mopped asphalt applied to the metal deck with a fiberglass-asphalt impregnated vapor barrier set into the hot asphalt. A second mopping of hot asphalt attached the fiberglass insulation board to the top of the vapor barrier. An asphalt based built-up roof with a gravel topping covered the insulation board.

Recent reroofings involved tearing off the combustible roof materials and replacing them with a Class I roofing system' with mechanical fasteners for the insulation board. However, the complete removal of the combustible asphalt from the metal deck is difficult to accomplish.

[1] A Class I roofing system is a Factory Mutual System approved assembly with limited potential for contributing to fire spread during an interior fire.

Therefore, even where a Class I roofing system had been installed, fue1 supplies for a fire immediately under the metal deck remained. (See Lessons Learned for more on this type of fire.)

Interior Separations

The partition walls between the tenant stores and between the common mall and individual stores varied in their construction type and ability to resist fire, heat and smoke spread. These partition walls in the stores remaining to the east included hollow concrete block (HCB), HCB with brick facing, and gypsum board on metal studs. Most walls were sealed to the roof deck above the suspended ceiling to minimize the spread of fire and smoke from store to store. Some of these walls were not adequately sealed to the roof deck or contained "poke through" holes which resulted in some additional damage in some stores.

Due to the destruction and cleanup operations in and adjacent to the area of origin, the store separation wall construction in the Mall's Center Section could not be completely evaluated. The east wall of the G. C. Murphy store was constructed of 8-inch HCB which was continuous from the concrete floor to the bottom of an unprotected steel beam that supported the roof. This wall, combined with fire department support, stopped the fire's spread into the adjacent store. In the Center Section, south of the G. C. Murphy Store, the separation walls between stores that helped stop the fire's eastward travel had been removed by the cleanup operation. The separation walls at the south and west extremes of fire travel in the Center Section were constructed of a combination of HCB and brick. See the analysis of fire spread for additional information about these walls.

The separation between stores and the common covered mall also varied throughout the East and Center Sections. It was not possible to identify all separation construction in the Center Section due to the destruction and cleanup operation. However, the G. C. Murphy store did have an open security grill and glass display windows with minor amounts of gypsum wall board over metal studs facing into the common covered mall. Some of the stores used sliding glass doors or swinging doors in place of open security grills on their entrances. The heat and smoke damage in stores with doors was less than in stores that used open grills. Above the mall ceiling, the separations generally consisted of gypsum board attached to wood or metal studs. In most instances, both sides of the studs were covered with gypsum board; a few stores were found with only the mall side covered by gypsum board.

BUILDING FIRE PROTECTION

The Logan Valley Mall's unsprinklered areas were protected in 1969 by an ADT Teletherm B 4205 System originally employing only ADT thermopile type heat detectors. Parts of the original system had this style heat detector replaced with UL listed combination 135F fixed temperature and rate-of-rise detectors in recent years. It was reported that the different types of heat detectors were not mixed on the same zone. The heat detection system was divided into 17 zones but it did not identify the specific heat detector in alarm either at the panel or at the device. The system was maintained, tested, and monitored by a central station fire alarm company. The system had a history of false or unwanted alarm activations. It is not known if the point of origin had thermopile heat detectors or the combination fixed temperature and rate-of-rise detectors.

Partial automatic sprinkler protection was installed and plans were in process to complete this protection for the entire complex. The area of fire origin and the adjacent stores and common covered mall were not protected. Six automatic sprinkler heads were observed to have fused as a result of the fire. The fused automatic sprinkler heads were located in the first branch line at the separation between the sprinkler protected store and the unprotected covered mall area. The sprinkler heads were located below the noncombustible suspended ceiling and did not cover the space between the roof deck and the ceiling. The sprinkler systems were supported by fire department apparatus during the fire and all operated satisfactorily.

Around the mall was an eight-inch looped water main supplying fire hydrants and the various automatic sprinkler systems. The loop is supplied by 12-inch water mains in both Plank Road and Goods Lane with a 24-inch feeder main nearby. Flow test records for the complex indicate that more than 2,500 gpm at 20 psi was available on the water main loop. (See Appendix B, Figure 3 and Appendix C for additional information.) Chief Sral indicated that water was not a problem during the fire although the local water authority is seeking a means to charge someone for the water used.

Mill Run Creek at the edge of the complex was also used as a water supply source. Four engine companies drafted from this source and supplied units on the north side of the fireground.

THE FIRE

The fire alarm activation was received by the central station at 2:29 a.m. on Friday, December 16, 1994. At that time, the Logan Valley Mall was occupied by a single cleaning/ maintenance worker who was in the west half of the mall which starts at the J. C. Penney Store. Earlier, he had been working in the east half of the mall where the fire started. Prior to hearing the fire alarm, he indicated that no other signs of fire were observed during his shift. The stores had closed at 10 p.m. that evening with no reports of unusual conditions.

The Logan Township Dispatch Center recorded the alarm time as 2:32 a.m. with the dispatch of four Logan Township fire companies to a general fire alarm. The initial box alarm assignment consisted of four township fire companies with four pumpers, one tanker, a squad, a ladder truck and chief officers. (See Appendix D for the dispatcher's log.)

The Lakemont Fire Company, located approximately one-half mile away, is first-due and has the Logan Valley Mall within its boundaries. Lakemont Chief Tom Sral (radio signature 15 Chief in the log) reported on the scene at 2:37 a.m. He responded directly to the north side of the complex where the fire alarm system zone annunciator panels are located on the exterior wall. This area is very near the rear of the G. C. Murphy store where the fire is believed to have started.

Chief Sral observed smoke at the roof line of the G. C. Murphy store and requested a second alarm plus the City of Altoona's ladder truck. He entered the covered mall area through doors on the north side near the Crocodile Alley store and proceeded south to the east-west covered mall segment which passes in front of the Murphy store. There he observed heavy black smoke pouring through Murphy's security gate into the mall and moving into other stores to the south. No flames were observed. He returned to the exterior and directed the first-in engine company to advance a 2-l/2" handline with four firefighters through the same mall entrance. A five-inch supply line was stretched from this engine to a nearby loop hydrant.

The first-in engine company had advanced into the structure a short distance when the suspended ceiling tiles began to drop on them. They then backed out to the entrance. About 10 minutes after their arrival, a section of the roof at the rear of the G. C. Murphy store collapsed, venting the fire. About this time Chief Sral requested an "all call" for assistance through the Logan

Township Dispatch Center. First with all township companies, then Blair County companies, and then through surrounding county emergency centers.

Pre-incident planning and drills had been conducted at the Logan Valley Mall through the fourth alarm level. Chief Sral indicated the fire almost immediately exceeded these needs. However, the pre-incident work, which included practice advancing hand lines and deluge sets with large diameter hose lines into specific points in the mall, allowed for an aggressive combined exterior and interior attack which effectively cut off the fire at strategic locations. The standardized training firefighters received is credited for the fireground efficiency and safety which all of the fire companies exhibited during this incident. Many firefighters had never met before this fire yet they worked as if they routinely drilled together.

Chief Sral became the overall incident commander and was assisted by Logan Township Fire Marshal Joseph Lynch. An informal but workable incident command system was established. Arriving chief officers of other township fire companies were assigned to geographic sectors such as the food court, front of Cinema IV, J. C. Penney rear, and rear comer.

Early in the fire, communications became a struggle between the scene and the Logan Township Dispatch Center. The primary radio frequency, which is used throughout Blair County for the alerting and dispatch of all the volunteer fire companies, is also the primary communications channel between the incident commander and the dispatch center. The traffic on this frequency was nearly continuous between alerting, dispatching, and responding companies. Fortunately, Fire Marshal Lynch was able to reach the Logan Dispatch Center on the police radio frequency in his unit. This contact was later supplemented by a cellular phone provided by the county emergency services office.

Fireground communication was facilitated by the use of a second fireground frequency which is common to Blair County companies and officers' radios. While companies from other counties had different primary frequencies, their multiple channel radios often contained Blair County's primary frequency and sometimes the fireground frequency. There was not a common regional emergency radio frequency.

Deluge sets with solid stream nozzles, mostly supplied by large diameter hose lines, were advanced into the covered mall as planned. Handlines were also advanced into the stores as planned to supplement and support the physical separation of the common mall area from the stores. Elevated master streams were positioned at the rear (north side of the mall) of the G. C. Murphy store and J. C. Penney store to work on the main body of fire and support the separation walls. Additional elevated streams were positioned at the front (south side of the Mall) of the J. C. Penney store and at the Cinema IV for the same purposes.

Four deluge sets were placed inside the J. C. Penney store, two on each floor, to support the separation wall and the glass covered openings into the covered mall. These deluge sets were not called upon to operate and the glass did not fail. Lines were also connected to the sprinkler siamese connections at J. C. Penney, Sears, and for the food court and adjacent stores.

At least 8 elevated master streams, 7 deluge sets, and numerous handlines operated during the fire attack. In addition to the hydrants supplied by the Altoona Water Authority, four pumpers of 1,000 gpm or greater were drafting from the Mill Run Creek running on the north and west sides of the mall. These units supplied large diameter hose lines to engine and truck companies operating at the rear of the fire. Reportedly some of the water was recycled as the runoff entered the stream and the drafting apparatus sent it back out to the fire again.

Approximately 45 minutes to 1 hour after arrival, a major roof collapse occurred over the G. C. Murphy store and the adjacent stores to the south and west. The signs of impending collapse were identified shortly before it occurred and firefighters were ordered out of the building. Although not previously agreed upon by SOPS, all apparatus on the scene sounded their air horns after hearing the evacuation command on the radio. Following the collapse, interior operations were carefully resumed at the perimeter of the fire. Companies reported that interior visibility improved following the roof collapse due to improved ventilation.

Eventually responding to the fire were 359 firefighters from 59 fire companies/departments located in five Pennsylvania counties. Some companies traveled over 30 miles to reach tie fire. All but one of the fire companies were volunteer. Two minor firefighter injuries occurred: a cut finger and debris in an eye. Neither required hospital treatment. The complete details on the response produced by the Logan Township Dispatch Center are attached as Appendix E. Although

companies started to be released at about 8:30 a.m., about 100 firefighters and emergency personnel reportedly remained on the scene through the following Tuesday. Food and refreshments were generously donated by local businesses, the American Red Cross and the Salvation Army.

FIRE SPREAD

The fire was stopped at the J. C. Penney store on the west, the Cinema IV on the south, and the parking lot to the north. It was stopped at the east wall of the G.C. Murphy store which was a non-loadbearing, 8-inch HCB wall. A partial wall collapse occurred at the north end of this wall in the Mall's utility garage area; however, the store to the east received only smoke and water damage.

The fire and heat spread for a considerable distance in the covered mall area from in front of the G. C. Murphy store east to the food court. The covered mall's roof collapsed for about 60 feet to the east of the G. C. Murphy store. Further to the east, a roof section approximately 80 feet long was left standing but showed signs of burning on the underside of the deck. A kiosk below this section suffered only smoke and water damage. East of the standing section, another part of the roof collapsed in a lean-to fashion for a distance of approximately 60 feet. This collapse was due to the roof support beam on the south side rolling over. A candle kiosk under this collapse was not burned and the visible candles were not melted. One basket of candles was covered with melted tar, likely from the roof. (See Appendix F)

The fire damage and collapse of the covered mall roof was attributed to fire spreading under the metal deck roof. The fuel for this fire was the melted and vaporized asphalt from the adhesive and vapor barrier above the metal deck and under the roof insulation. This flammable vapor leaked into the building through the seams in the metal deck where it ignited. This combustion melted and vaporized more asphalt, creating a self-sustaining fire under the roof deck. The undamaged combustible kiosks at floor level further support this observation and also document the effectiveness of firefighter tactics and operations in this area.

The food court had a long skylight covering approximately 20 percent of the roof area. Panels in the skylight were broken during the fire, which relieved the heat and smoke in the immediate area but also drew heat and smoke from the fire in the G. C. Murphy store down the

covered mall into the food court. Visible heat damage to a steel beam and bar joists at the northwest comer of the food court's roof indicates a hot gas flow pattern into the skylight. Other evidence of the flow is the steel roof support beam that rolled over and caused a roof collapse directly north of the food court. Areas directly between roof vents and the fire will usually suffer greater damage than other adjacent spaces.

To the south of the G. C. Murphy store, the fire was stopped at the separation wall between The Limited store and B. Moss, another clothing store. (The construction characteristics of this wall could not be identified because it had been removed by cleanup operations.) Neither store was protected by automatic sprinklers. The contents of the B. Moss store received only smoke and water damage even though the roof to the north and west had collapsed.

The Cinema IV was essentially a separate building at the south end of the fire area even though the structure formed part of a covered corridor with the stores to the north. This single story building had HCB and brick exterior walls and was of noncombustible construction. The common wall with the mall was HCB and contained a single double metal swinging door opening. Fire resistance ratings on the doors were not determined and evidence indicates that they did not receive a significant fire exposure. Damage to the Cinema IV was reported to be from water and smoke.

The J. C. Penney Store's separation from the covered mall consisted of a brick-faced 8-inch HCB wall and three large unprotected glass covered openings. Two of these were for show window openings and the third was for the store entrance which was closed at the time of the fire. Due to aggressive fire department actions, the tempered glass covering these openings did not fail during the fire. While not a rated fire wall due to the three openings, this wall was a significant factor in stopping the westward fire travel. The J. C. Penney side of the wall had automatic sprinklers spaced along the openings and the wall. All head spacings were on an ordinary hazard basis. The fire did not cause any heads to cperate. No sprinkler heads protected the mall side of the wall and wall openings.

With one exception, the separations, combined with aggressive firefighter support, stopped the fire and heat spread from the covered mall into the stores. Smoke and water damage was significant even where the heat and fire was halted. The one separation failure observed occurred at the wall between the covered mall and the food court. It is believed that the large skylight, broken

out during the fire, drew the heat into this area resulting in failure of a main steel roof support beam. There may have been a similar failure at G. C. Murphy to the covered mall separation but due to the destruction this could not be determined.

CODES

The Logan Valley Mall is outside the limits of the City of Altoona in Logan Township, Blair County. According to Township Fire Marshal Lynch, the BOCA National Fire Prevention Code was adopted several years ago. However, no building code has been adopted in the township. The State of Pennsylvania has a labor code that governs exits from structures. Local authorities believed the complex was generally in compliance with this code.

The Lakemont Fire Company and other Logan Township fire companies have conducted pre-incident planning and drills at Logan Valley Mall. Periodic inspections have been conducted and the owner has generally been cooperative.

The application of the 1994 edition of *The Life Safety Code*® NFPA Standard 101, would have required the entire complex to be protected by automatic sprinklers. In addition, the covered mall area would have likely caused the installation of a smoke control system because of exit travel distance limits. These requirements apply to both new and existing covered shopping malls.

The Logan Valley Mall owner, Crown American Properties, L.P., was in the process of preparing plans to complete the automatic sprinkler protection throughout the complex. Additional improvements, such as smoke control, were not identified during the investigation. A new roof covering that was installed the previous summer was specified to be Class I construction. It was applied after the old roof covering had been removed down to the steel roof deck.

LESSONS LEARNED

1. ***Combustible roof coverings attached to a corrugated metal deck roof can contribute to rapid fire spread through otherwise essentially noncombustible spaces.***

This hazard was first published following the 1953 fire in Livonia, Michigan and has reoccurred several times since. An exposure fire heating the corrugated metal roof deck melts and vaporizes the asphalt material commonly used as both the adhesive and part of the vapor barrier. The insulation board, laid into and on top of these layers, and the layers of felt and additional asphalt on top of the insulation do not allow the vapors to escape upwards. As a result, these flammable vapors are forced through the seams in the metal deck panels into the building. The fire inside the building ignites these vapors which continue the process of generating fuel and fire under the metal deck. The heavy black smoke produced often obscures the flames in such a fire. Large caliber hose streams are needed to cool the metal roof deck and supporting structures. Water must reach the deck; steam does not provide the required cooling. Where ceilings are installed, they need to be removed to provide access for cooling hose streams.

2. Removing combustible roof covering and replacement with Class I or noncombustible coverings does not completely eliminate the hazard.

Parts of the complex had new roof coverings which were specified to meet Factory Mutual requirements for a Class I roof covering. Inspections by FM Engineering report that the roofing contractor was following proper procedure for installing a Class I covering. Mechanical fasteners, used with such roof installations, were found in some metal roof deck panels after the fire. The problem is that asphalt remains attached to the metal deck and in the corrugation valleys even when the old roof covering is tom off. This melts and vaporizes, providing the fuel for a fire under the deck. The age and history of the structure's roofing need to be included in pre-incident planning.

3. Pre-incident planning and multiple company drills in the structure contributed to cutting off the fire 's spread and containment.

The Logan Township fire companies were well prepared for a fire within the complex. The planning included drills where portable deluge sets and their supply lines were actually advanced and placed. The officers and firefighters who had participated in these efforts were not only able to carry them out but they also provided the leadership for mutual aid companies who had not drilled inside the complex. In operations of this magnitude, it is not practical or desirable for the incident commander to direct individual company operations.

Sector commanders have to be relied upon to both undertake their tasks and keep the incident commander and adjacent sectors informed of actions, progress and failures. In addition, companies must have knowledge of and confidence in the sector commanders. Pre-incident planning and multiple company drills develop skills and this confidence.

4 . A strong water supply is required to support aggrressive attack on a fire of this magnitude.

The evaluation, analysis and maintenance of available water supplies is a critical element in successful fire suppression. Large undivided areas containing "ordinary hazard" combustible contents will develop into a large fire if not protected by automatic sprinklers. There are several formulas available for estimating water supply needs in these circumstances. These should be used to develop water supply estimates. Flow tests must be conducted to evaluate the quantity of water available and the condition of the delivery means. Where static or mobile water sources are employed, drills must be held and sustained long enough to realistically evaluate delivery rates. The information must be updated periodically to accommodate changes in water demands such as from new construction and industry.

5. Large diameter hose made possible the movement of the water volumes needed to supply the aggressive fire attack in this incident.

Large diameter hose supplied engine companies at the fire, elevated streams on the exterior and portable deluge sets placed inside the covered mall. The large diameter hose lines could be quickly located and placed into service to deliver deluging amounts of water. Their use eliminated the need for multiple hose lines and stretches to deliver at or near engine company pumping capacity.

6 . Planning for large properties should include an analysis of the anticipated radio traffic and available frequencies for fireground operations, dispatching and direction of incoming units.

In this incident, the primary radio frequency was used for tone activated dispatching, and for communication between the Township Dispatch Center, responding units and the incident commander. During the early stages of the incident, radio traffic on this frequency

was nearly continuous. Fortunately, Logan Township Fire Marshal Lynch had the ability to reach the Dispatch Center on the township police frequency. This allowed Incident Command to request additional resources even while the primary fire frequency was in use. A portable cellular phone was also placed into service at the command post to provide another communications path. Logan Township and Blair County companies have a separate fireground frequency which assisted with command and control. Many of the mutual aid companies from other counties had the Logan Township primary fire frequency in their radios.

One problem did arise because of the duration of the fire. Portable hand-held radio batteries became depleted and there were problems obtaining enough spare, charged batteries at the scene. Planning must also anticipate the possible duration of an incident and the resources required to sustain operations.

7. Automatic fire detection has no effect on fire growth and does not prevent large fires from occurring.

The area of the complex where the fire is believed to have started was provided with heat detectors. According to officials, the system was installed in compliance with the equipment's Underwriters Laboratories listing and was tested and maintained on a regular basis. The type of heat detection device, a thermopile, is considered to respond relatively quickly to flaming fires. However, once at the flaming stage, fires in large spaces grow geometrically with time until either fuel or air supplies limit the growth rate. Fire growth must be controlled in order to stop a fire from becoming large. Heat detectors, and other types of fire detectors in general, may sound an alarm and summon the fire department, but they do not have any capability to control the fire's growth. The major benefit of automatic sprinklers is their ability to control many fires while still small.

8 . Compartmentation is also important in large occupancies.

Those stores with solid type (windows, glass doors, walls) separations from the covered mall suffered less damage than stores with open grill separations.

Open grill security separations allowed the free passage of smoke and heat into stores from the common, covered mall. This contributed to smoke and water damage to the stores' contents. Additionally, the forcible entry through these separations was more difficult and time consuming than for stores with solid separations. Smoke damage in a retail store is often as costly as direct fire damage. Controlling smoke travel is an important element in limiting damage. Rated fire resistance in the separation is not as important as a solid separation with minimal unprotected penetrations. NFPA 101, *Life Safety Code*, does not require separation between the covered mall and the tenant stores, but does require automatic sprinklers and a "smoke control system" within the covered mall. These systems were not present in this incident.

9. Pre-incident planning should incorporate visits to buildings during construction, major remodeling and expansion projects. Elements affecting the building's structural stability can be altered or concealed during this time.

During the survey of the damage to the structure, a previously unidentified, concealed, potential hazard was discovered. Near the front of two stores damaged by the fire was a 50-foot long brick faced HCB wall supported by an unprotected steel beam lintel. The wall was 12 to 14-inches thick and 5 to 6 feet high in the ceiling space. This wall was above the suspended ceiling in these stores. Building additions and renovations can result in unexpected structural changes. Some may not present a hazard during normal building operations but can result in dangerous surprises during fires. Construction visits and inspections combined with pre-incident plans can assist in noting such hazards for the future.

Stores with windows, glass doors, walls or other solid separations to the covered mall had less water and smoke damage than stores with open security grills or bars.