

fire protection planning report



BUILDING CONSTRUCTION INFORMATION FROM THE CONCRETE AND MASONRY INDUSTRIES

NO. 8 OF A SERIES

FIGHTING ARSON WITH FIRE-RESISTIVE CONSTRUCTION



The \$4 million Center for Professional Development at Florida State University lies in ruins after a devastating arson fire. The fire occurred just two weeks before the scheduled move to the all-wood structure was to take place. The heads for the automatic sprinkler system were to have been installed the week following the fire. (Photograph courtesy of Florida Bureau of Fire Investigations.)

Arson is the leading cause of fire and property loss in the United States. Nearly 1000 lives are lost and 10,000 to 15,000 injuries occur every year due to deliberately set fires. According to the National Fire Protection Association, arson causes over \$1 billion in direct property damage each year; other estimates are as high as \$3 billion. Indirect costs, which include lost jobs, lost property tax revenue, higher insurance premiums, and countless other expenses, bring the total annual arson bill to \$10 to \$15 billion. Arson may be the most expensive property crime in the United States.

Arson may be the fastest-growing crime in America, as well. Arson fires now represent approximately 25% of all building fires. Over 30% of the total dollar loss from fire is attributable to arson.

These figures are the result of a 400% increase in arson in the past decade.

Arson Prevention

People commit arson for various reasons. There are five main groupings for the motives of arsonists: profit, concealment of other crimes, vandalism and malicious mischief, revenge or spite, and pyromania or other mental illness. (See Table 1.)

As with accidental fires, preventing arson fires is the first line of defense. Major efforts have been undertaken by local governments, federal agencies, and the insurance industry in setting up arson prevention programs. These programs are mostly directed toward preventing arson-for-profit

Table 1. Motives for Arsonists

Motive	Survey by the LEAA ¹	Wisconsin Dept. of Justice ²	Three articles cited by LEAA ³
Arson for profit or personal gain	14%	17%	3-19%
Arson to conceal other crimes	7%	11%	7-10%
Vandalism and malicious mischief	42%	21%	35-50%
Revenge or spite	23%	24%	18-30%
Pyromania or other mental illness	14%	27%	15-25%

¹Stephen H. Webster and Kenneth E. Mathews, Jr., "A Survey of Arson and Arson Response Capabilities in Selected Jurisdictions," prepared for Law Enforcement Assistance Administration by Abt Associates, Inc., February 1979, page 10. Note: These data are estimates based on responses from 16 major cities. Two cities used actual case counts; the other cities gave impressions.

²Figures based on 212 investigations in 1976 through 1977 that found known motives; another 135 cases had unknown motives.

³J. A. Inciardi, "The Adult Firesetter, a Typology," *Criminology*, August 1970, pages 145-155; E. Robbins and L. Robbins, "Arson With Special Reference to Pyromania," *New York State Journal of Medicine*, March 15, 1967, pages 795-796; R. C. Steinmetz, "Current Arson Problems, Part I," *Fire Journal*, September 1966, page 25; all cited in Webster and Mathews, pages 10, 27.

(Courtesy of Arson Resource Exchange Bulletin, FEMA.)

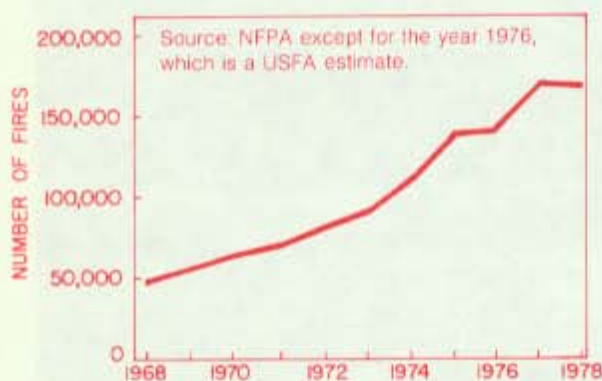


Fig. 1. Arson fires in structures in the United States, 1968-1978.

(Courtesy of Arson Resource Exchange Bulletin, FEMA.)

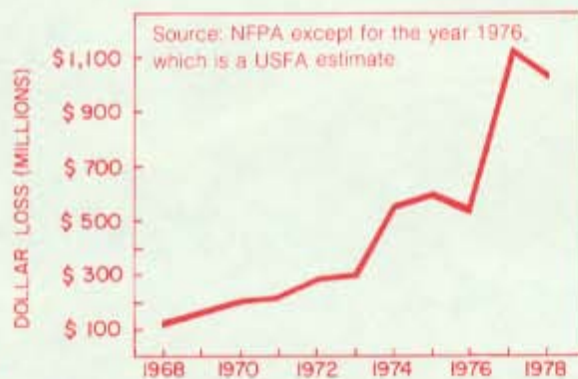


Fig. 2. Arson dollar loss in structures in the United States, 1968-1978.

(Courtesy of Arson Resource Exchange Bulletin, FEMA.)

fires. By far, the greatest potential for reducing arson exists for arson motivated by financial gain. It is the easiest motive to predict and therefore prevent.

However, recent surveys indicate that arson for profit accounts for only 15% of all arson fires. The most common motives for arson are vandalism (40%) and revenge (25%). Arson motivated by psychological factors is almost impossible to predict or prevent. Therefore, protection is the most dependable defense against arson. Once an arson fire has started, adequate fire protection must be provided for the safety of life and property.

Arson Protection

The factors necessary for controlling an arson fire coincide with the fundamentals of firesafety in

buildings. These include fire-resistive construction, compartmentation and firewalls, automatic smoke detection and control, and automatic suppression (sprinklers). While all these factors are important, none is more important in an arson fire than the use of fire-resistive construction.

When "torching" a building, an arsonist will probably first disable the sprinkler system. The building construction must then be relied on to prevent collapse of the structure and protect occupants from fire and smoke until they can be safely evacuated. The structural fire resistance of concrete and masonry construction is built in—it can't be turned off either accidentally or intentionally. Its fire resistance will always be there when needed—today, tomorrow, and throughout the life of the building.

The type of construction in a building does



An unsuccessful arson attempt. The gasoline can and shredded papers are good indicators of arson. The hole was punched into the wood-frame wall to facilitate fire spread. (Photograph from *Arson: Origin and Cause Determination, Part A*. Copyright © 1979 National Fire Protection Association, Quincy, Massachusetts. All Rights Reserved.)

make a difference. In buildings composed of combustible construction, structural members can burn, support a fire, contribute to the fire spread, and eventually collapse. Prompt evacuation is essential in buildings having combustible construction if lives are to be saved.

Arson fires are often fueled by accelerants such as gasoline or other flammable liquids. Such fires burn quickly, trapping occupants and endangering firefighters. In combustible construction, the fire can spread quickly enough to make escape impossible. The possibility of structural collapse endangers firefighters attempting to rescue occupants and also hampers firefighting operations.

In contrast, buildings of fire-resistive construction generally can withstand the ravages of fire with little structural damage. They will not support or contribute fuel to a fire. Compartmentation and firewalls confine fire and limit its spread, adding time for building occupants to escape and providing firefighters with the protection needed to extinguish a fire safely.

In any building, fuel for fire can be supplied by combustible interior finishes and furnishings. Therefore, it is also important that automatic detection be provided and that fire suppression activities be initiated as quickly as possible to ensure life safety.

Building and Fire Codes

While the arson problem is national in scope, it is

the responsibility of each municipality to set up and implement arson prevention and control programs to meet its particular needs. Some large cities have developed top-notch arson squads and patrols, sophisticated reporting procedures, and other programs. These efforts, however, are directed primarily at reducing the incidence of arson for profit and do not address the problems associated with the majority of arson-type fires. In addition, smaller communities have neither the manpower nor the financial resources to develop such programs.

Local building and fire codes and their enforcement can play a crucial role in the fight against arson. Increased fire-protection requirements in building codes and strict enforcement of building and fire prevention codes can decrease the vulnerability of building occupants and property to both arson and nonarson fires. Fire-resistive construction is necessary to achieve these results.

Tradeoffs

In the past few years, there has been a growing trend to trade off the life safety and property protection features of buildings when automatic sprinklers are installed. These tradeoffs include a reduction in fire resistance, longer travel distances to exits, and increased flame spread ratings of interior finishes. An automatic sprinkler system, no matter how sophisticated, is nonetheless a mechanical system and, as such, is subject to failure. Should the sprinkler system in a building employing tradeoffs be shut down either accidentally or intentionally, the facility essentially becomes an unsprinklered building employing sprinkler tradeoffs.

Nowhere is the concept of tradeoffs under greater scrutiny than in cases of arson. Arson has become a common fire scenario, accounting for nearly 25% of all building fires. Arson fires are set with the intention of destroying a building. If the automatic sprinklers are shut down in a building constructed using tradeoffs, a fire is likely to cause greater damage.

Arson fires do not behave like other fires. In addition to using accelerants, an arsonist may start multiple fires or bring in large amounts of combustibles to increase the fuel loading. These fires will spread more quickly and reach higher initial temperatures than accidental fires. High-intensity fires set by an arsonist can outrun or overtax a sprinkler system specifically designed to control a fire under ordinary-hazard or low-hazard conditions.

Sprinklers, therefore, cannot be relied on as a sole source of protection. Structural fire resistance and other life-safety features simply must not be traded off.



Arson in residential buildings is unfortunately a frequent occurrence, often resulting in death or injury of the occupants. Rapidly spreading arson fires endanger firefighters and expose neighboring properties. (Photograph courtesy of Chicago Fire Department.)

Arson in Residential Buildings

Arson fires in residential buildings often result in death or injury of the occupants. In 1978, arson fires in residential units accounted for 78% of the deaths and 71% of the injuries of all arson fires in structures. In residential buildings, arson is the third leading cause of fire and second leading cause of property loss.

Arson fires are especially tragic in apartment buildings, boarding houses, hotels, and motels. In this type of building, each occupant is subject to the actions of his neighbors. Should one person accidentally cause or deliberately set a fire, the

lives and property of everyone in that building are placed in jeopardy. Many multifamily buildings are built to the same standards of fire protection as single-family dwellings, despite the greater number of residents and the increased chance of fire.

Many communities concerned with the increased risk in multifamily occupancies have upgraded their local building codes to provide two-hour noncombustible fire separations between dwelling units. This concept, called compartmentation, limits the spread of fire by confining it to the compartment of origin. The lives and property of other occupants are thus protected from the careless or intentional acts of a neighbor.

A recent study of fires in low-rise multifamily buildings, conducted by the University of Maryland (see Fire Protection Planning Report No. 6), shows that as the fire resistance of a building increases, the extent of flame damage and the amount of property loss decreases. Fire-resistive noncombustible construction is the best type of construction for limiting fire spread and minimizing dollar loss. The use of concrete and masonry construction to limit fire spread and the installation of automatic detection systems to provide early warning and evacuation can help protect occupants of multifamily buildings from arson and nonarson fires.



The occupants of this concrete and masonry apartment building are protected from the actions of their neighbors by fire-resistive floors, walls, and ceilings.

Protecting Commercial Properties

Arson is the leading cause of fires, deaths, injuries, and dollar loss in nonresidential buildings. These



Arson strikes all types of building occupancies, as these newspaper clippings indicate.

fires account for 28% of all fires, deaths, and injuries, and 40% of the total dollar loss.

When commercial properties are destroyed, the whole community suffers—jobs and tax revenues are lost, and prices of goods increase. In a small community, a major fire in even one plant could be disastrous.

Commercial properties are susceptible to arson fires set by disgruntled employees, business competitors, and vandals, and are prime targets during contract negotiations and employee strikes. Also, experience has shown that once arson has been attempted unsuccessfully, there will usually be followup arson attempts in the first few weeks after the initial fire.

Storage areas, both interior and exterior, are the most susceptible targets of arsonists. Exterior storage yards should be completely fenced in and adequately lit to deter arsonists. Interior storage areas should be protected with adequate automatic detection or extinguishing systems and separated from the rest of the building by firewalls. Since arsonists often tamper with these systems, firewalls are essential to limit the spread of fire and reduce potential damage. Dividing plants by firewalls has long been one of the most effective ways of minimizing risk. The greater the number of firewalls, the smaller the area at risk.

Other precautions include regular inspection of automatic detection and extinguishing systems; the use of security guards, particularly during employee strikes; prefire planning; good housekeeping practices; and the organization of a plant fire brigade.

Arson in Other Structures

Arson fires are especially frequent in schools and vacant structures. In schools, 58% of all fires are due to arson. These acts of vandalism are costly to everyone since they result in higher taxes and disruption of education. In protecting schools, fire-resistant, noncombustible construction and automatic detection systems are essential.

Vacant buildings are another prime target for arsonists. Over 66% of fires in these structures are attributable to arson. While these fires might seem of little concern, they can easily spread to nearby occupied buildings. Also, firefighters combating a blaze in an empty building are unnecessarily exposed to hazards and may be prevented from responding to other fires in occupied buildings.

Shutting off sprinkler systems to prevent pipes from freezing due to the lack of heating is a major contributor to severe fires in vacant buildings. Sprinkler protection should be maintained using acceptable cold-weather procedures.

Other precautions against arson in vacant buildings should include guard service for valuable properties and periodic inspection for properties of lower value. The exterior of the building and the grounds should be maintained. Broken windows should be repaired or boarded over and all doors securely locked.

Buildings under construction are extremely vulnerable to arson. Large amounts of combustible materials are usually stored on the site, making a good target for the arsonist. Automatic sprinkler systems are of little value during construction

since they are usually put into operation just prior to occupancy.

Unlike other types of construction, concrete and masonry offer the advantage of built-in protection. As the structure goes up, so does the fire protection. Good housekeeping and guard service can also help protect against arson at the construction site.

An increasing problem is the use of combustible exterior siding. Often garbage collection bins are stored along the outside of buildings. Vandals often set rubbish fires, which can readily spread to nearby buildings that have combustible siding or overhangs. The use of noncombustible siding can help eliminate this hazard.

Summary

1. Arson has become a common fire scenario, accounting for nearly 25% of all building fires and over 30% of the total dollar loss.
2. Arson is primarily a crime against property. Most often arson is committed for reasons other than profit, making arson prevention difficult and protection against arson necessary.
3. Arson protection coincides with the fundamentals of building firesafety and property protection. The most important protection features are the use of fire-resistive, noncombustible construction; firewalls; and compartmentation.
4. Due to the high rate of arson and the susceptibility of automatic sprinklers to accidental or intentional failure, the concept of trading off life-safety and property-protection features is unjustified. This trend should be reversed.
5. The use of concrete and masonry construction in multifamily buildings has been statistically

proven to reduce the extent of flame spread and minimize property damage. Compartmentation using two-hour noncombustible tenant separations can limit the spread of fire and contain it within the compartment of origin, protecting occupants from the careless or intentional acts of a neighbor.

6. The use of firewalls in commercial properties to limit fire spread has long been regarded as one of the most basic and dependable methods of reducing risk.

Organizations represented on the CONCRETE AND MASONRY INDUSTRY FIRESAFETY COMMITTEE

BIA	Brick Institute of America
CRSI	Concrete Reinforcing Steel Institute
ESC&SI	Expanded Shale Clay and Slate Institute
NCMA	National Concrete Masonry Association
NRMCA	National Ready Mixed Concrete Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute

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