National Fire Sprinkler Association Inc.

F.Y.I.

Fire Sprinkler Facts

Sprinklers were invented by an American, Henry S. Parmalee, in 1874 to protect his piano factory.

Until the 1940s and 1950s, sprinklers were installed almost exclusively for the protection of buildings, especially warehouses and factories. Insurance savings, which could pay back the cost of the system in a few years time, were the major incentives.

Following several fires with large losses of life (Coconut Grove Nightclub, Boston, 1942 – 492 dead; LaSalle Hotel, Chicago, 1946 – 61 dead; Winecoff Hotel, Atlanta, 1946 – 119 dead) fire and building officials searched for a means to provide life safety for building occupants. They found that factories and other buildings equipped with automatic sprinklers had an amazingly good life safety record compared with similar unsprinklered buildings.

▶ ***What determines where and when sprinklers are required?***

Building codes over the past two decades have increasingly called for sprinklers throughout buildings for life safety, especially buildings in which rapid evacuation of occupants is difficult or the hazard posed by contents is high.

▶ ***Why are there additional local ordinances?***

Where the building codes don't go far enough, many states and cities enact special tough sprinkler ordinances. The State of West Virginia, for example, requires sprinklers throughout all new buildings exceeding 40 feet in height. The city of Oak Brook, Illinois, requires sprinklers throughout all new buildings exceeding 1,000 square feet in area except single-family dwellings. Some communities, such as San Clemente, California, and Greenburgh, New York, require fire sprinkler protection even in new single-family homes.

▶ ***What is retrofit legislation?***

In addition to requiring sprinklers throughout new buildings, some cities have encouraged sprinkler installation in existing buildings. These include New York City's landmark Local Law 5 for high-rise office buildings, and a Chicago

Printed in USA

ordinance requiring sprinklers throughout all nursing homes.

High-rise hotels have been required to retrofit with fire sprinklers in the states of Nevada and Florida, and in the city of Honolulu, Hawaii.

Recent high-rise retrofit laws include those enacted in Atlanta in 1989 and in Philadelphia in 1991.

▶ *What's happening outside the U.S.?*

In some countries, such as Japan, automatic fire sprinkler systems are used almost exclusively for life safety protection, and are being required throughout new and existing buildings.

▶ *How do sprinklers operate?*

Automatic fire sprinklers are individually heat-activated, and tied into a network of piping with water under pressure. When the heat of a fire raises the sprinkler temperature to its operating point (usually 165°F), a solder link will melt or a liquid-filled glass bulb will shatter to open that single sprinkler, releasing water directly over the source of the heat.

▶ *Why are sprinklers so effective?*

Sprinklers operate automatically in the area of fire origin, preventing a fire from growing undetected to a dangerous size, while simultaneously sounding an alarm.

Automatic fire sprinklers keep fires small. The majority of fires in sprinklered buildings are handled by one or two sprinklers.

▶ *Why are sprinklers important for life safety?*

Sprinklers do not rely upon human factors such as familiarity with escape routes or emergency assistance. They go to work immediately to reduce the danger.

Sprinklers prevent the fast developing fires of intense heat which are capable of trapping and killing dozens of building occupants.

▶ *What about smoke?*

Smoke, a by-product of fire, is generally the cause of death to building occupants. Although smoke is produced as sprinklers extinguish a fire, such quantities of smoke are less than those which would be produced by an unsprinklered fire permitted to grow.

▶ *Who decides design and installation procedures for sprinkler systems?*

Proper design and installation of sprinkler systems is standardized nationally in a consensus standard promulgated by the National Fire Protection Association - NFPA 13.

A basic premise of proper sprinkler protection is that sprink-

lers be installed throughout *all* building areas. Partial sprinkler protection is a game of chance, since a fire originating in an unsprinklered area can overpower sprinklers once given a head start.

▶ *What is the life safety record for fully sprinklered buildings?*

Aside from fire fighting and explosion fatalities, there has never been a multiple loss of life in a fully sprinklered building due to fire or smoke. Individual lives have been lost when the victim or his clothing or immediate surroundings became the source of the fire.

A National Fire Protection Association study for the years 1971-1975 found that approximately 20 lives are lost each year in this country in sprinklered buildings, as compared to approximately 8,000 per year in unsprinklered buildings. Some 68% of the lives lost in sprinklered buildings were due to explosions, and an additional 18% were due to the fact that the fire originated in an unsprinklered area of the building.

▶ *How reliable are fire sprinklers?*

All fire protection features have a reliability factor. Walls and shafts can be breached by means of poke-throughs and building alterations. Exit doors can be blocked or locked.

Sprinklers may be the most reliable fire protection system known. Detailed fire records for Australia and New Zealand (where fire must be reported) for the years 1886 through 1968 showed that 99.76% of all fires were extinguished or controlled by the sprinklers. Fire records in this country are less dependable due to lack of full reporting, especially for small fires where the sprinklers are successful. Nevertheless, the range includes a 96.2% success record reported by the National Fire Protection Association for the years 1925 through 1969, 98.4% success record for New York city high-rise buildings between 1969 and 1978, and a 98.2% success record for U.S. Department of Energy facilities between 1952 and 1980.

▶ *How can you be sure a system will operate when needed?*

Electrical supervision of sprinkler systems to monitor valves and water flow is a major plus in assuring system reliability and effectiveness, and is required by many building codes for large and important system installations.

▶ *Can sprinklers discharge accidentally?*

Loss records of Factory Mutual Research indicate that the probability of a sprinkler discharging accidentally due to a manufacturing defect is only 1 in 16,000,000 sprinklers per year in service.

▶ *How much does a new sprinkler system cost?*

The cost of a complete sprinkler system depends on many factors, such as the building type and construction, availability of public water supply, and degree of hazard of the occupancy. For new construction, systems usually cost from $1.00 to $1.50 per square foot, less than the cost of carpeting.

The major model code organizations, in releasing average costs of sprinkler systems for building permit purposes, listed the following add-on costs for new construction in 1990:

- Building Officials and Code Administrators: 93¢ to $2.00/sq. ft.
- International Conference of Building Officials: $1.50/sq. ft.
- Southern Building Code Congress: $1.50/sq. ft.

▶ *How much does retrofit cost?*

Retrofit installations in existing buildings can be expected to cost somewhat more than for new construction, depending on the difficulty of installation and other factors. A general rule of thumb is to add 50%.

▶ *What are "trade-offs"?*

The system cost can often be offset by insurance savings, and by specific design alternatives or "trade-offs" permitted by most building codes in view of the superior protection afforded by sprinklers. These trade-offs often include reduced fire-resistant requirements for structural components, longer exit travel distances, and larger building areas and heights.

▶ *Aren't sprinklers ugly?*

Due to advances in sprinkler technology, sprinklers look better than ever, if you can see them at all. Sprinklers can be concealed behind ceilings, out of sight until needed to extinguish a fire. Sprinklers are also available in a range of colors and sizes to blend into the background of any room.

▶ *What about water damage?*

Reports of water damage due to fires in sprinklered buildings are often exaggerated due to comparisons with the small fire loss which occurs thanks to the sprinklers.

The amount of water which is put on a fire by fire department hoses in an unsprinklered building fire is nearly always tens to hundreds of times more than that which sprinklers would have discharged. During a fire, only those sprinklers closest to the fire activate, limiting the total amount of water needed. The fire damage, as reflected by insurance claims, is also many times greater.

There have been hundreds of multiple-death (three or more people killed) building fires in the United States since fire sprinklers were invented. These fires, all in unsprinklered buildings, have killed thousands of people, not to mention the property damage. A few of the more notable fires are listed here, though, unfortunately, the complete list is much longer. (Number of deaths in bold type.)

170 **Rhodes Opera House**
Boyertown, Pennsylvania
January 12, 1903

602 **Iroquois Theatre**
Chicago, Illinois
December 30, 1903

175 **Lakeview Grammar School**
Collinwood, Ohio
March 4, 1908

145 **Triangle Shirtwaist**
New York, New York
March 25, 1911

77 **Cleveland School**
Beulah, South Carolina
May 17, 1923

38 **Bond Dance Hall**
West Plains, Missouri
April 13, 1928

125 **Medical Clinic**
Cleveland, Ohio
May 15, 1929

320 **Ohio Penitentiary**
Columbus, Ohio
April 21, 1930

48 **Home for the Aged**
Pittsburgh, Pennsylvania
July 24, 1931

32 **Terminal Hotel**
Atlanta, Georgia
May 16, 1936

207 **Rhythm Club**
Natchez, Mississippi
April 23, 1940

492 **Coconut Grove Nightclub**
Boston, Massachusetts
November 28, 1942

32 **Forrest Park Sanitarium**
Seattle, Washington
January 31, 1943

54 **The Gulf Motel**
Houston, Texas
September 7, 1943

61 **The LaSalle Hotel**
Chicago, Illinois
June 5, 1946

119 **Winecoff Hotel**
Atlanta, Georgia
December 7, 1946

74 **St. Anthony Hospital**
Effingham, Illinois
April 4, 1949

41 **Mercy Hospital**
Davenport, Iowa
January 7, 1950

35 **Littlefield Nursing Home**
Largo, Florida
March 29, 1953

72 **Katie Jane Nursing Home**
Warrenton, Missouri
February 17, 1957

29 **Barton Hotel**
Chicago, Illinois
February 12, 1955

95 **Our Lady of Angels Grade School**
Chicago, Illinois
December 1, 1958

20 **Thomas Hotel**
San Francisco, California
January 6, 1961

25 **Surfside Hotel**
Atlantic City, New Jersey
November 18, 1963

22 **Roosevelt Hotel**
Jacksonville, Florida
December 29, 1963

25 **Dale's Penthouse Restaurant**
Montgomery, Alabama
February 7, 1967

13 **Randolph Tavern**
Moberly, Missouri
February 16, 1968

31 **Nursing Home Marietta, Ohio**
January 9, 1970

20 **Ozark Hotel**
Seattle, Washington
March 20, 1970

19 **Point Square Hotel**
Los Angeles, California
September 13, 1970

28 Pioneer Hotel
Tucson, Arizona
December 20, 1970

15 Nursing Home
Honesdale, Pennsylvania
October 19, 1971

32 Cocktail Lounge
New Orleans, Louisiana
June 24, 1973

25 Apartment House
Los Angeles, California
November 15, 1973

15 Galey Nursing Home
Wayne, Pennsylvania
December 4, 1973

24 Gulliver's Discotheque
Port Chester, New York
June 30, 1974

12 Washington House Hotel
Berkeley Springs,
West Virginia
August 25, 1974

11 Seminole County Jail
Sanford, Florida
June 9, 1975

20 Pathfinder Hotel
Fremont, Nebraska
January 10, 1976

24 Winecrest Nursing Home
Chicago, Illinois
January 30, 1976

25 Social Club
Bronx, New York
October 23, 1976

16 Stratford Hotel
Breckenridge, Minnesota
January 28, 1977

164 Beverly Hills Nightclub
Southgate, Kentucky
May 28, 1977

42 Maury County Jail
Columbia, Tennessee
June 26, 1977

20 Coates House Hotel
Kansas City, Missouri
January 28, 1978

20 Allen Motor Inn
Honesdale, Pennsylvania
November 5, 1978

12 Tenement
Newark, New Jersey
December 7, 1978

15 Mental Hospital
Ellisville, Mississippi
December 29, 1978

14 Boarding Home
Bradley Beach, New Jersey
July 26, 1980

85 MGM Grande Hotel
Las Vegas, Nevada
November 21, 1980

26 Stouffer's Inn
Harrison, New York
December 4, 1980

31 Beachview Rest Home
Keansburg, New Jersey
January 9, 1981

12 Westchase Hilton
Houston, Texas
March 7, 1982

13 Pinter Hotel
Hoboken, New Jersey
March 6, 1982

24 Dorothy Mae Apartment Hotel
Los Angeles, California
September 4, 1982

29 Biloxi Jail
Biloxi, Mississippi
November 8, 1982

8 Home for the Mentally Handicapped
Annandale Village,
Georgia
August 31, 1983

14 Elliott Chambers Rooming Home
Beverly, Massachusetts
July 4, 1984

14 Alexander Hamilton Hotel
Paterson, New Jersey
October 18, 1984

97 Dupont Plaza Hotel
San Juan, Puerto Rico
December 31, 1986

10 Single Family Dwelling
Minnesota
January 1, 1989

12 Hillhaven Nursing Home
Norfolk, Virginia
October 5, 1989

16 John Sevier Retirement Center
Johnson City, Tennessee
December 24, 1989

87 Happy Land Social Club
Bronx, New York
March 25, 1990

9 Fontana Hotel
Miami, Florida
April 6, 1990

3 One Meridian Plaza
Philadelphia, Pennsylvania
February, 1991

Established in 1914, the National Fire Sprinkler Association, Inc. (NFSA) is a non-profit trade association comprised of installers and manufacturers of fire sprinklers and related equipment and services. Professional and Subscriber memberships are also available. The NFSA provides publications, seminars, representation in codes and standards-making, market development, labor relations, and other services to its members. Headquartered in Patterson, New York, the NFSA has regional offices throughout the country.

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To be effective, fire sprinkler systems must be installed by qualified, competent contractors. For more information, contact the NFSA, or look in the Yellow Pages under Automatic Sprinklers for the names of contractors in your area.