

LARGE-LOSS FIRES IN THE UNITED STATES-2008

**Stephen G. Badger
Fire Analysis and Research Division
National Fire Protection Association**

November 2009



**National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471
www.nfpa.org**

LARGE-LOSS FIRES IN THE UNITED STATES-2008

**Stephen G. Badger
Fire Analysis and Research Division
National Fire Protection Association**

November 2009



**National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471
www.nfpa.org**

Acknowledgements

NFPA thanks the U.S. fire service for its contributions of data, without which this report would not be possible. In many cases, the fire departments were unable to contribute complete details to NFPA on these larger-loss incidents because legal action is pending or ongoing, or they are unable to determine many pieces of information we need to make our study as complete as possible. The author wishes to thank Norma Candeloro for providing the support this study requires.

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

Copies of this analysis are available from:

National Fire Protection Association

One-Stop Data Shop

1 Batterymarch Park

Quincy, MA 02169-7471

www.nfpa.org

e-mail: osds@nfpa.org

phone: 617-984-7443

NFPA No. LLS08

Copyright © 2009, National Fire Protection Association, Quincy, MA

Introduction

For the fifth time in the past 10 years, the largest loss associated with fires and explosions occurred in wildlands, and for the second year in a row, it happened in Southern California. In mid-November, several wildfires broke out within a three-day period, eventually becoming known as the Tea Fire, the Sayre Fire, and the Freeway Fire complexes. These fires, which resulted in an estimated \$800 million in property damage, are treated collectively in this study as a single incident, since they occurred in an area that was experiencing a period of drought, with high temperatures, low humidity, and high winds.

The Tea Fire broke out at 5:50 p.m. on a Thursday afternoon, after a group of young adults had a campfire the night before. The group told investigators that the fire was out when they left. High winds during the next day brought the embers back to life, eventually developing into a 1,940-acre (785-hectare) wildfire that destroyed more than 200 residential structures and damaged many more. The Sayre Fire broke out on Friday and burned through a manufactured home park, destroying 480 of the 600 homes. It ultimately burned 11,262 acres (4,558 hectares) and destroyed 489 residential structures, 10 commercial properties, and 104 out buildings, and damaged many more. The cause was not determined.

The Freeway Fire broke out on Saturday, burned through 30,305 acres (12,264 hectares), destroyed 187 residential and 2 commercial properties, as well as 11 outbuildings, and damaged 127 residential properties, 2 commercial properties, and 32 outbuildings. The cause of this fire was also listed as undetermined.

Chaparral, oak, eucalyptus groves, sagebrush, and grass, as well as more than 1,000 structures, were the major fuels contributing to the fires.

During these fires, unified commands were set up. Firefighters from all over the country, 3,700 in all, battled not only these fires, but Santa Ana winds of above hurricane force (above 75 miles, or 120 kilometers, per hour), with very high temperatures. The fires were mostly under control or contained by November 22. Residents evacuated more than 60,000 homes during the fires. More than 30 injuries were reported; at least 19 of the victims were firefighters.

NFPA reports each year on large-loss fire and explosion losses in the United States, now defined as any event that results in property damage of at least \$10 million. In 2008, fire departments responded to an estimated 1,451,500 fires. These fires caused an estimated loss of \$15.5 billion. Many of the fires were small or resulted in little or no reported property damage. However, 35 fires resulted in losses of \$10 million or more each. With direct property losses totaling over \$2.34 billion, these 35 fires killed 15 civilians and injured 60 civilians and 32 firefighters. Although these fires accounted for only 0.002 percent of the estimated number of fires in 2008, they accounted for 15.3 percent of the total estimated dollar loss.

Since 1987, the dollar loss threshold defining large-loss fires for this report has been \$5 million. To reflect the effect of increases in the Consumer Price Index over the past 20-plus years, however, we have raised that threshold. In this report, all the calculations were done using the new threshold of \$10 million. This threshold returns us to the intent of this study, which is to

provide a better perspective on the costliest losses each year. Interestingly, based on the Consumer Price Index, a fire resulting in a loss of \$5 million in 1987 would be equal to a loss of more than \$9 million in 2008 dollars.

The number of large-loss fires meeting the new threshold decreased by 10, or 22 percent, from 2007, and the direct property loss in these fires was down by over \$1 billion from 2007. In large part, this decrease was due to one wildfire in 2007 that caused almost \$2 billion in damages. No comparable loss occurred in 2008.

Before inflation adjustments were made, the number of large-loss fires in 2008 was the second highest in the past 10 years. When adjusted for inflation to 1999 dollars, the number of fires in 2008 that could be categorized as large-loss fires that is, loss of \$10 million in 1999 dollars drops to 23, with an adjusted loss of \$1.7 billion in 1999 dollars.

Including the Southern California wildfires of 2008, 20 fires resulted in more than \$20 million each in property damage. These costliest 20 fires, which include 16 structure fires and 4 wildland fires, resulted in a combined property loss of \$2.2 billion, which represents 92.4 percent of the total loss in large-loss fires and 14.1 percent of the total fire losses of 2008. Five incidents in 2008 resulted in losses of over \$100 million each. The combined loss for these fires was \$1.7 billion, or 66.7 percent of the large-loss total and 10.3 percent of the total fire losses in 2008.

There was a general downward trend in the number of large-loss fires from 1999 through 2006, but the total rose sharply in 2007. Though the number of fires dropped in 2008, it was still the second-highest total over the most recent 10-year period. Total loss in large-loss fires is too sensitive to the specific loss in the costliest incidents each year to show any clear trend.

Where fires occurred

Thirty-one of the large-loss fires of 2008 occurred in structures, and they resulted in a total property loss of \$1.4 billion. The other four occurred in wildland fires and resulted in a total property loss of \$929 million.

Thirteen fires and explosions occurred in manufacturing properties, resulting in a total loss of just over \$1 billion. Six residential property fires resulted in a loss of \$170.5 million. Of these six fires, three occurred in apartment buildings, two in lodging properties, and one in a resort/spa.

Four each occurred in wildlands and storage properties, resulting in losses of \$929 million and \$44 million, respectively.

Three fires each occurred in buildings under construction, including two apartment buildings and one motel, and in public assembly properties, including a film studio back lot, a restaurant, and a country club. Fires in these two categories resulted in property losses of \$109.3 million and \$63.5 million, respectively.

One fire each occurred in industrial and educational properties an oil refinery and a university administration building resulting in losses of \$20 million and \$14 million, respectively.

Information on operating status was reported for 24 of the 31 structure fires. Twenty-one were operating to some extent. Nineteen were at full operation or occupancy, one was partially operating with some construction workers at the site, and a watchman was present at one. Three properties were closed or were not known to have anyone on site when the fire broke out.

None of the structure fires was incendiary in nature. One wildfire was deliberately set. The resulting loss in that fire was \$24 million, or 2.6 percent of the non-structure fire loss.

Ten of the fires, all in structures, broke out between 11 p.m. and 7 a.m.

Detection and suppression systems

Information about smoke detection equipment was reported for 17 of the 31 structure fires. Ten of these 17 properties, or 59 percent, had some type of automatic detection equipment. Seven fires occurred in properties that had no automatic detection equipment.

Of the 10 properties that had equipment, four had complete-coverage smoke detection systems. One was partially covered with a heat and smoke detection system. The coverage was not reported on the other five systems, which included one heat detection system, two smoke detection systems, and two whose type was not reported. Seven of the 10 systems operated effectively. One failed to operate, but the reason was not reported. The operation or effectiveness of the other two systems was not reported.

Information on automatic suppression equipment was reported on 21 of the 31 structure fires. Ten structures had no suppression equipment, and 11 had some type of system.

Of the 11 systems, three were complete-coverage wet-pipe systems, three were wet-pipe systems whose coverage was not reported, one was a partial- or local-coverage wet-pipe system, and one was a combination wet- and dry-pipe system with complete coverage. The other three were reported simply as sprinkler systems, with no type reported. One of these had partial or local coverage, and the coverage of the other two was not reported.

Eight of the 11 systems operated. One did not operate, and the operation of two systems could not be determined. In the case of the system that did not operate, the fire originated in concealed spaces and caused the piping to the sprinklers to rupture. In one of the cases where the operation of the system could not be determined, a broken pipe in the system hindered firefighters, but it was not reported what broke the pipe.

Six of the eight systems that operated were not effective in controlling the fire, and the effectiveness of one system that operated was not reported. Only one system was effective in controlling the fire in its coverage area. This was in a hotel where the fire originated on the exterior and burned exterior structural and decorative components. After the fire broke windows and spread into several guest rooms, the sprinkler system activated and confined the interior fire to those rooms.

Three of the systems that operated but were not effective were not in the area of origin. In those incidents, the fires originated on a roof, in an unprotected attic space, and on the exterior wall/roof assembly. Spreading fire overpowered these three systems once it burned into a protected section of the structure. Of the remaining three systems that were not effective, one operated at first but was damaged by a secondary explosion, one was in a space that had a larger fire load than the system could handle, and one operated initially but shut off for an unexplained reason.

Complete information on both detection and suppression equipment was reported for 17 of the 31 large-loss structure fires. Three had only detection equipment, two had only suppression equipment, seven had both detection and suppression, and five properties, or 16 percent of all structures, had no coverage.

What we can learn

As mentioned earlier, the number of fires in 2008 with losses of at least \$10 million decreased by almost a quarter from the total in 2007, and the associated property losses decreased by more than \$1 billion. That difference in dollar loss can be accounted for largely by one fire in 2007 that resulted in a loss of more than \$1 billion. In seven of the past 10 years, there has been at least one fire with a loss of over \$100 million. In 2008, there were five such incidents, for a total loss of \$1.6 billion.

Adherence to the fire protection principles reflected in NFPA's codes and standards is essential if we are to reduce the occurrence of large-loss fires and explosions in the United States. Proper design, maintenance, and operation of fire protection systems and features can keep a fire from becoming a large-loss fire. Proper construction, storage, and housecleaning will make fires less likely and help control or limit the fire spread if fire occurs.

Where we get our data

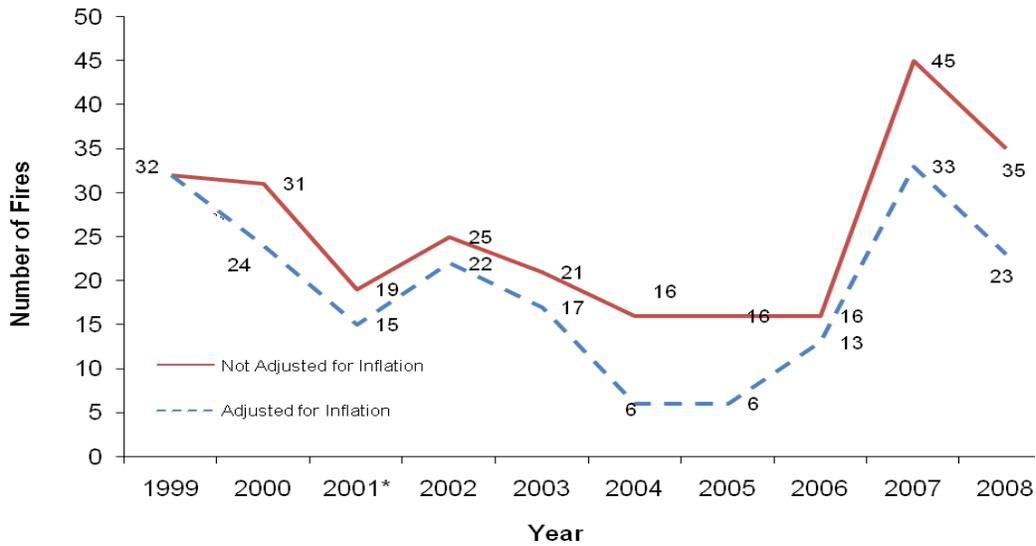
NFPA identifies potential large-loss incidents by reviewing national and local news media, including fire service publications. A clipping service reads all U.S. daily newspapers and notifies the NFPA's Fire Analysis and Research Division of major large-loss fires. NFPA's annual survey of the U.S. fire experience is an additional data source, although not the principal one. Once an incident has been identified, we request information on the fire from the fire department or agency having jurisdiction. We also contact federal agencies that have participated in investigations, state fire marshal's offices, and military sources.

The diversity and redundancy of these data sources enable the NFPA to collect the most complete data available on large-loss fires.

About the author

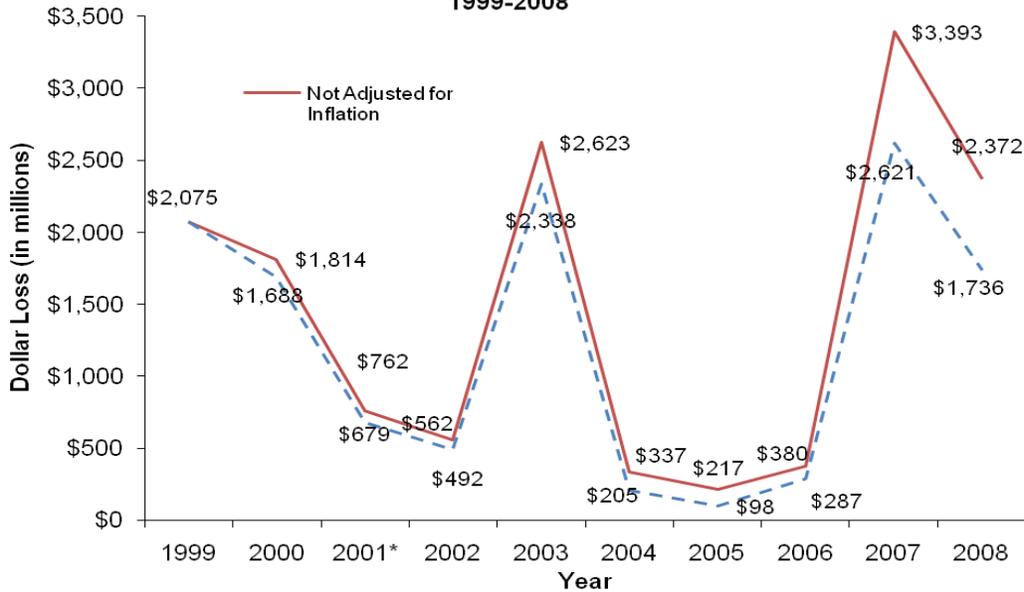
Stephen G. Badger is a fire data assistant in NFPA's Fire Analysis and Research Division and is a retired firefighter from the Quincy, Massachusetts, Fire Department.

Figure 1
Large-Loss Fires, Unadjusted and Adjusted for Inflation, 1999 - 2008



Note: The 2001 totals include the 9/11/01 World Trade Center incident

Figure 2
Direct Dollar Loss in Large-Loss Fires, Unadjusted and Adjusted, 1999-2008



Note: Losses exclude the 9/11/01 World Trade Center incident

Figure 3
2008 Large-Loss Fires by Major Property Use

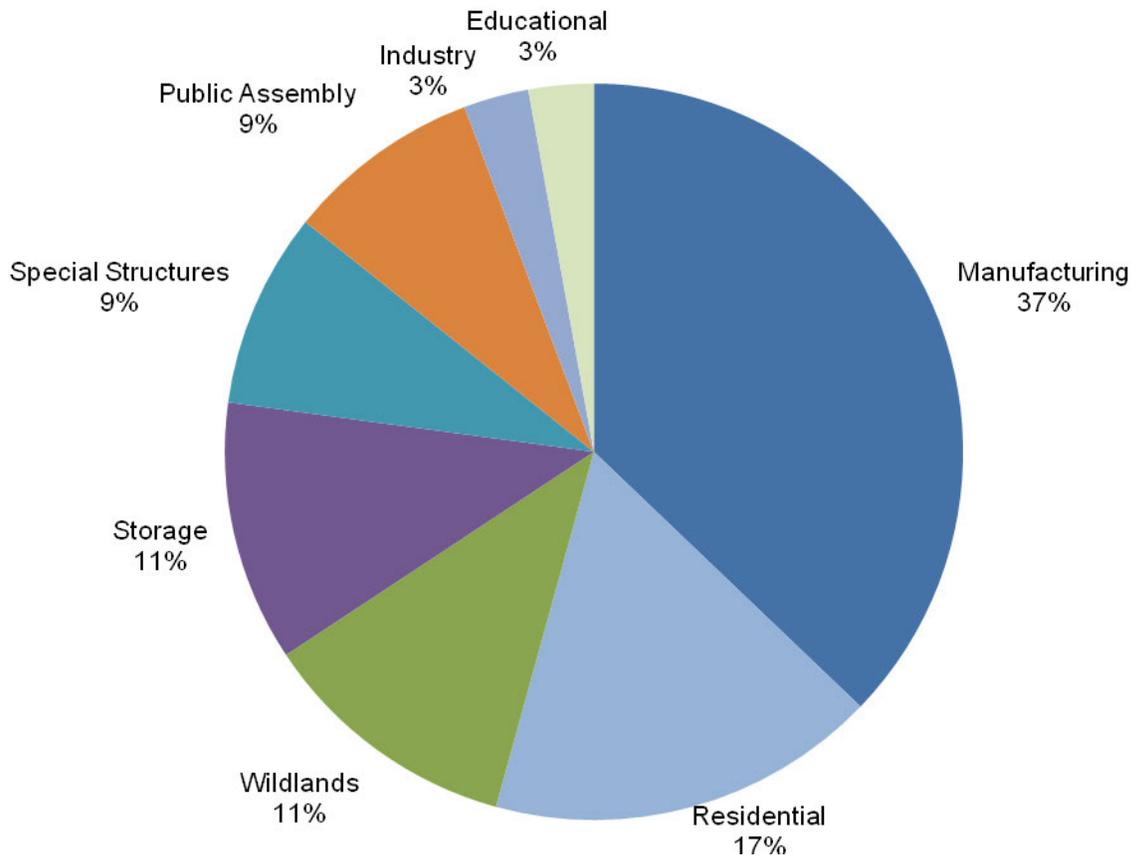


Table 1
Large-Loss Fires that Caused \$10 million or More in Property Damage, 1999-2009

Year	Number of Fires	Number of Fires Causing \$10 million or More in 1999 Dollars	Direct Property Damage (in Millions)	
			As Reported	In 1999 Dollars
1999	32	32	\$2,075	\$2,075
2000	31	24	\$1,814	\$1,688
2001*	19	15	\$762	\$679
2002	25	22	\$562	\$492
2003	21	17	\$2,623	\$2,338
2004	16	6	\$337	\$205
2005	16	6	\$217	\$98
2006	16	13	\$380	\$287
2007	45	33	\$3,393	\$2,621
2008	35	23	\$2,372	\$1,736

* Excluding the 9/11/01 World Trade center incident from the loss totals but not the fire incident totals.

Note: Number of fires and unadjusted loss are based on data from studies that appeared in previous annual large-loss studies. Some of the information may differ from previously published material because fire reports were updated after publication.

Note: Adjustment for inflation is based on the Consumer Price Index using 1999 as the base year. Note that adjustment for inflation not only reduces the the total dollar loss for each year but also reduces the number of fires when adjusted losses large enough to qualify as large-loss fires.

Source: NFPA's Fire Incident Data Organization (FIDO).

Table 2
Large-Loss Fires of \$20 Million or More in 2008

Incident and Location	Loss in Millions
Wildfires, California	\$800.0
Steel Plant, Michigan	\$400.0
Sugar Refinery, Georgia	\$275.0
Hotel/Casino, Nevada	\$100.0
Meat Processing Plant, Arkansas	\$100.0
Apartment Building under Construction, Pennsylvania	\$75.0
Wildfire, California	\$55.0
Steel Mill, Maryland	\$50.0
Wildfire, California	\$50.0
Tire Manufacturing Plant, Georgia	\$46.0
Film Studio, California	\$38.0
Boat Manufacturing Plant, Maine	\$30.0
Furniture Manufacturing, Mississippi	\$25.5
Apartment House and Church, District of Columbia	\$25.0
Paper Goods Manufacturing, Florida	\$24.0
Senior Living Apartments under Construction, Minnesota	\$24.0
Wildfire, California	\$24.0
Manufacturing Plant, New York	\$20.0
Brewery, New York	\$20.0
Refinery, Alaska	\$20.0
Total - 20 fires	\$2,201.5

Source: NFPA's Fire Incident Data Organization (FIDO).

Table 3
2008 Large-Loss Fires by Major Property Use Classification

Property Use	Number of Fires	Percent of Fires	Total Dollar Loss	Percent of Loss
Manufacturing	13	37%	\$1,021,763,000	43.1%
Residential	6	17%	\$170,500,000	7.2%
Wildlands	4	11%	\$929,000,000	39.2%
Storage	4	11%	\$44,000,000	1.9%
Special Structures	3	9%	\$109,273,000	4.6%
Public assembly	3	9%	\$63,500,000	2.7%
Industry	1	3%	\$20,000,000	0.8%
Educational	1	3%	\$14,000,000	0.6%
Total	35	100%	\$2,372,036,000	100.0%

Source: NFPA's Fire Incident Data Organization (FIDO)

2008 Large-Loss Fire Incidents

The following is a complete list of large-loss fires, which are listed in descending order of loss amount in each category.

Manufacturing Properties

Michigan

\$400 million

January, 11:55 p.m.

This gas-fed blast furnace was located in a steel plant that covered 2 million square feet (185,186 square meters) and was of unprotected, noncombustible construction. Neither the height of the furnace, nor of the structure in which it was located, was reported, but it was operating at the time, and six people were in the area of the furnace at the time of the explosion.

The type of detection equipment could not be determined. No information was reported on suppression equipment.

The cause of the explosion is under investigation, but it involved molten materials.

Upon arrival, firefighters found that the blast furnace had exploded and was burning. There were also some spot fires in the operations building. The explosion damaged at least six vehicles, several trailers, and outbuildings, and injured a person who was driving past the building in which the furnace was located when it exploded. Investigators believe the age of the furnace was a contributing factor in the explosion. The roof was blown off and debris was blown 50 yards (46 meters) away.

Georgia

\$275 million

February, 7:18 p.m.

This 97-foot (30-meter) high sugar refinery was of unprotected noncombustible construction and covered 75,000 square feet (6,968 square meters). The plant was in operation at the time of the explosion and fire.

The packing house had a partial-coverage heat and smoke detection system that activated when the first explosion occurred, but it was soon disabled by a second explosion that destroyed most of the electrical equipment. It also had a complete-coverage combination wet- and dry-pipe sprinkler system. It activated but was also disabled by the secondary blast. Due to the damage, it was not possible to determine how many sprinklers opened.

The cause and origin of the primary dust explosion are under investigation. The secondary explosion occurred in the dust handling equipment and simultaneously ignited fires on several floors that spread throughout the packing house building. Also ignited was a palletizing area in the distribution warehouse and two of the three sugar silos.

Arriving firefighters found that the packing house had sustained a massive explosion and a large fire was burning. Numerous workers were dead, injured, or missing. Fire officials did a size-up of the damaged plant, as firefighters began search and rescue operations and worked to contain the fire. Firefighting operations were from the exterior due to the extent of damage, poor visibility, and the possibility of structural collapse. During initial operations, fire officials determined there had been nine separate building or structural collapses. Fourteen workers were killed in the explosions or died during the following month due to their injuries. The victims' locations at the time of the explosion were not reported.

Arkansas

\$100 million

March, 12:58 p.m.

This was a one-story meat packing plant of unprotected noncombustible construction that covered 150,000 square feet (14,000 square meters). The plant was operating with approximately 24 people inside.

No information was reported on fire protection systems, fire development, or contributing factors.

Maryland

\$50 million

July

This fire occurred at a steel mill, but no further information was reported.

Georgia

\$46.26 million

November, 1:43 a.m.

This two-story tire manufacturing plant was of unprotected, noncombustible construction and covered 248,131 square feet (23,052 square meters). The plant was closed at the time of the fire, but a security guard was located in another area of the complex.

There was no automatic detection or suppression equipment.

A fire of undetermined cause broke out in a manufacturing area near the quality control department.

There was a delay in detection as the security guard was not near the area of origin, allowing the fire to progress for some time. By the time fire apparatus arrived, the blaze had already vented

through the roof and was growing rapidly, spreading into and through a warehouse section where finished tires were stored. One firefighter suffered smoke inhalation.

Maine

\$30 million

July, 9:23 a.m.

This four-story boat manufacturing facility was of unprotected, wood-frame construction and covered 90,000 square feet (8,360 square meters). The plant was operating at the time of the fire.

No information was reported on the facility's detection equipment. It had an unknown-type sprinkler system, but its coverage was not reported. The sprinklers activated initially, but then reportedly shut down. The reason it shut down was not reported.

Welding and cutting work on a tug boat was being done too close to a wall of the building, causing it to ignite. The fire was first spotted on the interior of the wall, then observed to be on the exterior of the roof and spreading.

Arriving firefighters found the structure fully involved. The fire spread to several other buildings in the boat yard and to three tugs under construction. It also damaged several nearby homes and several vehicles. One civilian was injured.

Florida

\$27 million

February, 5:28 p.m.

This one-story paper product manufacturing plant was of unprotected noncombustible construction. The ground floor area was 12,800 square feet (1,189 square meters). The plant was operating at the time of the fire.

The plant had smoke alarms, which operated, but the system coverage was not reported. A sprinkler system of unreported type also operated, alerting the occupants and sounding an automatic alarm at the fire department. Its effectiveness in controlling the fire was not reported.

A fire of undetermined cause broke out in a process area. No additional information was reported.

The loss was estimated at \$5 million to the structure and \$22 million to the contents.

Kentucky

\$25.5 million

February, 5:30 p.m.

This one-story furniture manufacturing plant was of unprotected, noncombustible construction and covered 600,000 square feet (55,741 square meters). It was operating at the time of the fire. The plant had no automatic detection or suppression equipment.

A fire of unknown cause broke out in the warehouse section of this plant. At the time of the fire, the area was experiencing winds of 25 miles (40 kilometers) per hour.

Arriving firefighters closed many loading dock doors to help control the ventilation. A roof collapse forced the firefighters to evacuate. Firefighters were successful in keeping the fire from spreading into an office area.

New York

\$20 million

January, 2:57 p.m.

This one-story, multi-use manufacturing plant was of unprotected ordinary construction and covered 60,000 square feet (5,574 square meters). The plant, which included a textile waste remanufacturing company, was operating at the time of the fire.

There was no automatic detection equipment. The plant had a wet-pipe sprinkler system, but its coverage was not reported. The system operated, but the flow was not sufficient to be effective due to the large fire load.

The cause of this fire, which broke out in the process area, is listed as undetermined.

A brief interior attack was begun until extensive fire spread caused conditions to worsen and firefighters were withdrawn to a defensive attack.

New York

\$20 million

May, 5 p.m.

This four-story brewery of unprotected, ordinary construction covered 13,050 square feet (1,212 square meters). The plant was operating at the time of the fire.

Heat detectors were present, but the coverage and performance of the system was not reported. The brewery had no automatic suppression system.

This fire, caused by welding operations, broke out in a second-story packaging area. No additional information was reported.

A brief interior attack was initiated until extensive fire spread caused conditions to deteriorate and firefighters were withdrawn to a defensive attack.

Alaska

\$11 million

July, 1:13 p.m.

This one-and-a-half-story seafood cannery of unprotected, noncombustible construction covered 51,315 square feet (4,767 square meters). The cannery was operating at the time.

It had no automatic detection or suppression equipment.

A fire of undetermined cause broke out in a service area, but no additional information was reported.

The loss was estimated at \$10 million for the structure and \$1 million for the contents.

Georgia

\$10 million

May, 2 p.m.

This was a carpet manufacturing plant. No further information was reported.

Wisconsin

\$10 million

August, 2:29 a.m.

This was a two-story aluminum product manufacturing plant that was of unprotected noncombustible construction and covered 800,000 square feet (74,322 square meters). The plant was closed at the time of the fire.

There was no automatic detection equipment, and a partial-coverage wet-pipe sprinkler system did not protect the area of the building where the fire originated. One sprinkler did operate when fire spread to the protected area.

The fire, which started when lightning struck the roof of the plant, burned for an unknown period of time before it was discovered by a passerby.

The loss was estimated at \$5 million to the plant and \$5 million to the contents.

Residential Properties

Nevada

\$100 million

January, 10:58 a.m.

This 3,020-room hotel and casino complex was 32 stories high, covered 114,773 square feet (10,663 square meters), and was of protected noncombustible construction. The complex was in use at the time the fire, with 2,400 rooms occupied.

The structure had complete-coverage smoke detection equipment that activated, and an evacuation was begun when the fire was confirmed. The complex also had a complete-coverage wet-pipe sprinkler system. Eighteen of the system's sprinklers activated when the fire caused

windows in guests rooms on the 32nd story to fail, confining the interior fire to those rooms. The structure also had a full standpipe system and a diesel-powered fire pump.

The fire began when workmen performing cutting or welding on the exterior of the building ignited a layer of expanded polystyrene foam adhered to gypsum sheathing on the structure's architectural trim.

Upon arrival, firefighters found an exterior fire on the top of the hotel's tower. Evacuation of the hotel continued as firefighters set up unified commands and attacked the blaze using standpipes on the roof.

They also directed streams of water on the fire from windows on another wing. Fires in the guest rooms on the 32nd story were extinguished with hand lines after the sprinkler system contained these fires.

Thirteen guests were injured.

District of Columbia

\$25 million

March, 11:47 p.m.

This was a four-story, 100-unit apartment building of unprotected ordinary construction. The ground floor area was not reported. The building was occupied at the time of the fire, but the number of occupants was not reported.

The building had smoke alarms, but no information was reported on them. There was no automatic suppression system.

The fire began in the basement of the structure. The cause was listed as undetermined.

Firefighters fought this fire from inside the apartment building until conditions deteriorated, causing several firefighting teams to become lost, forcing them to call for assistance. The fire spread to and destroyed a three-story church of heavy timber construction.

One firefighter and three civilians were injured.

Connecticut

\$13 million

April, 1:26 a.m.

This 120-unit, unprotected, wood-frame apartment complex consisted of 20 three-story buildings in two clusters of 10 that covered 33,750 square feet (3,135 square meters). The complex was occupied by approximately 150 residents.

The complex had a complete-coverage smoke alarm system, with detectors in the living rooms and bedrooms of each unit. The system activated and alerted the occupants of the building. There were also manual pull stations in the exit access corridors. There was no automatic suppression equipment.

A discarded cigarette ignited combustibles in or around a bucket on the rear deck of a first-story apartment. The fire spread to the decking and siding materials and spread upward and throughout the complex.

This fire broke out during an extended dry spell when the fire danger reports were classified as extreme. A large quantity of combustible foliage next to the structure allowed for further propagation of the fire throughout the complex.

Firefighters from a dozen fire departments responded.

Florida

\$12 million

December, 9:51 p.m.

This four-story, 49-unit resort spa of unprotected ordinary construction covered 16,000 square feet (1,486 square meters). It was filled to capacity.

The spa had detection equipment, but the type and coverage were not reported. The system operated and alerted the occupants. It also had a wet-pipe sprinkler system of unreported coverage that activated, with 20 sprinklers flowing. The system was not fully effective, however, as it was not in the area of ignition. When the fire finally spread into the area of coverage, it was effective.

A fire of unknown cause began in a thatched palm awning on the second-story and quickly spread up and across the building's exterior, igniting second-story guest rooms as well as the soffit on the elevator tower. It also spread into an attic and down to the first-level dining area and bar.

The fire in the attic hampered firefighters, as the attic contained were hidden compartments resulting from multiple renovations. On other floors, firefighters found multiple levels of ceilings. The fire was deep-seated in heavy timber with wire mesh and stucco.

The loss was estimated at \$10 million to the structure and \$2 million to its contents.

Michigan

\$10.5 million

April, 10:01 a.m.

This three-story, 42-unit apartment building for older adults was of unprotected wood-frame construction. Its ground floor area was not reported. It was occupied at the time of the fire.

The building had a complete-coverage system of smoke alarms, but the system did not operate. The reason for this was not reported. It also had a complete-coverage wet-pipe sprinkler system, but the system did not operate as the fire started in a concealed space, and heat in the voids and concealed spaces caused the piping to rupture.

Radiant heat from a boiler located on the third story ignited the flooring and wooden structural members between the second and third stories. The fire traveled in hidden combustible voids in floor and wall spaces.

Firefighters made numerous rescues over ladders. Two civilians and one firefighter were injured. Losses were estimated at \$7.5 million to the structure and \$3 million to the contents.

New York

\$10 million

November, 12:26 p.m.

This one- and two-story, 114-unit motel of unprotected wood-frame construction was open and operating at the time of the fire. The ground floor area was not reported.

The motel had a complete-coverage smoke detection system that operated and alerted occupants and the fire department. It also had a complete-coverage wet-pipe sprinkler system. The system was not in the area of origin and was overwhelmed when fire spread into the area it covered.

The only information reported on fire development was that it began with an electrical malfunction in an attic.

The fire started in a void above a wooden tongue-and-groove ceiling and spread to an attic above the pool, then burned unchecked above the fitness area into guest rooms on the second story and into the motel lobby. The ceiling and roof collapsed during the fire.

Wildland

California

\$800 million

November, 5:45 p.m.

This incident evolved from a series of three separate wildfire complexes in Southern California within three days of each other. These were the Tea Fire, the Sayre Fire, and the Freeway Fire.

The cause of the first fire was determined to have been a group of approximately 10 college students holding a bonfire party. Those involved reported to authorities that the fire was out when they left. Authorities believe the fire smoldered until heavy winds reignited it the next afternoon. The cause of the other two fires is listed as under investigation. The fires burned separately and did not come together. A total of 43,500 acres (17,603 hectares) burned.

High Santa Ana winds, low humidity, high temperatures, and dry brush all contributed to these fires, which burned through fuels of chaparral, oak, eucalyptus groves, sagebrush, and grass, as well as more than 1,000 structures. As the fires burned, more than 3,700 firefighters from around the country responded. Most of the blazes were under control within 10 days.

A total of 1,046 structures were destroyed, including 889 residential properties, 2 commercial properties, and 155 outbuildings. Another 329 structures were damaged, including 281 residential properties, 2 commercial properties, and 46 outbuildings. In one manufactured home park, 480 of the 600 homes were destroyed. Injuries were minimal, with slightly more than 30 reported. At least 19 of the victims were firefighters. During the fires, 65,000 homes were evacuated at one time or another.

California

\$55 million

August, 3:17 p.m.

This wildfire in an urban/wildland interface was started by materials abandoned or discarded in light vegetation.

The fire burned vegetation within a city limit before it spread to a U.S. Air Force base, where it destroyed 190 single-family homes and 40 duplexes that were scheduled to be demolished.

Firefighters were hampered by non-functional hydrants in the housing area.

This fire burned 68 acres (28 hectares).

California

\$50 million

June, 2:54 p.m.

This wildfire, which occurred in an urban/wildland interface, started when an illegal campfire was left unattended and a hot ember ignited nearby brush.

The fire burned 520 acres (210 hectares) of brush and grass, and destroyed 14 structures.

At the time of the fire, the area was under an extreme fire danger warning, with drought conditions, relative humidity at 14 percent, and fuel moisture at 3 percent.

California

\$24 million

June, 12:14 p.m.

This incendiary wildfire occurred in an urban/wildland interface. No additional details were provided.

The fire burned 23,162 acres (9,373 hectares), as well as 93 residential properties, 167 outbuildings, and 104 vehicles.

At the time of the fire, the temperature was 83°F (28°C), winds were blowing at 25 miles (40 kilometers) per hour, and the fire danger was extreme.

Storage Properties

Illinois

\$12 million

February, 8:30 a.m.

This one-story boat storage building of unprotected noncombustible construction covered 28,800 square feet (2,676 square meters). The facility was operating at the time of the fire, with work being done on one of the stored boats.

The building had a detection system. The type and coverage of the system was not reported, but it did activate. There was also a wet-pipe sprinkler, but no information about it was reported.

The fire was of undetermined cause and origin. On arrival, firefighters found heavy smoke coming from a large metal storage structure containing boats.

No other details were provided.

Maine

\$12 million

December, 12:30 p.m.

This one-story storage building of unprotected ordinary construction covered 233,000 square feet (21,646 square meters) and stored rolled and baled shredded paper. The warehouse was open and operating.

No information was reported on the structure's detection equipment. There was a partial-coverage sprinkler system in the storage area. A pipe in the system was broken, but how or when the pipe broke, or whether the system activated, were not reported.

During overhead welding operations in the shipping and loading dock, hot slag fell on and behind stored and baled shredded paper. The fire spread, followed the roof line, and entered the main warehouse.

This fire ignited and burned rapidly despite a fire watch, fire blankets, and early detection. Employees used several extinguishers in an attempt to control the fire, but they were unsuccessful.

Firefighters attempted an interior attack on the fire several times, but they were hampered by water-soaked paper products that expanded and split apart, falling to the ground. Fire suppression operations were performed from the exterior.

Fire departments from more than 42 cities and towns responded before this fire was contained and extinguished several days later.

Pennsylvania

\$10 million

January, 4:45 p.m.

This a four-story warehouse covered 22,500 square feet (2,090 square meters).

No information was reported about the structure's fire protection systems, about the fire's development, or about contributing factors.

Pennsylvania

\$10 million

April, 2:45 a.m.

This four-story warehouse covered 45,000 square feet (4,181 square meters).

No information was reported on fire protection systems, fire development, or contributing factors.

Special Properties

Pennsylvania

\$75 million

August, 4:53 p.m.

This four-story apartment building was under construction, with sections still in the framing stage. The ground floor area was not reported. There were construction workers on location at the time of the fire and occupants present in nearby buildings.

Automatic detection or suppression equipment had not yet been installed.

The fire broke out after an errant spark from welding operations went unnoticed and ignited wood structural members. On arrival, the first firefighters found that the building was fully involved in fire and that flying embers had started spot fires on several other buildings.

The fire destroyed or damaged a total of four buildings, including two occupied apartment buildings. A total of 153 pieces of fire apparatus and 1,013 firefighters responded.

Minnesota

\$24 million

April, 1:21 a.m.

This one- and two-story apartment complex for older adults was of unprotected wood-frame construction and covered 130,000 square feet (12,077 square meters). At the time, it was under construction but near completion. No one was at the site at the time.

Neither detection nor suppression equipment had been installed yet.

The cause of this fire was listed as undetermined, but it started in the area of a workshop.

A passing police officer spotted the fire and reported it.

Virginia

\$10.27 million

September, 10:40 p.m.

This four-story hotel of unprotected wood-frame construction was under construction. Its ground floor area and operating status were not reported.

No information was reported on its fire protection systems.

Upon arrival, firefighters found the four-story structure fully involved in fire. Embers had started several smaller fires in adjacent properties.

A defensive attack was begun, and the bulk of the fire was knocked down in 30 minutes. One firefighter was injured.

The cause of the fire is under investigation.

Public Assembly Properties**California**

\$38 million

June, 4:50 a.m.

This was a large film studio and back lot for movies and television shows. The structures were of various heights and construction, with the majority of unprotected wood-frame construction. The area covered was not reported.

No information was reported on fire protection systems or fire development.

More than 400 firefighters responded to this fire. They were faced with several challenges, including a lack of water pressure and water supply, as well as explosions involving compressed gas containers, propane tanks, tires, and gas tanks of private vehicles. Firefighters were forced to draft water from lakes on the property.

Texas

\$15 million

September, 12:20 a.m.

This two-story restaurant was of unprotected ordinary construction. The ground floor area was not reported. The restaurant was closed due to a hurricane but three people, including two adults and a child, had taken refuge in the structure.

No information was reported on fire protection systems or fire development.

The hurricane's winds hampered firefighting operations. The three occupants suffered burns over 70 percent of their bodies, but they survived.

Idaho

\$10.5 million

December, 3:35 p.m.

This one-story country club of unprotected wood-frame construction covered 30,000 square feet (2,787 square meters). The clubhouse was operating at the time.

The type of detection equipment could not be determined. The clubhouse had no suppression equipment.

The cause and origin of the fire were listed as undetermined.

Upon arrival, firefighters found the clubhouse fully involved in fire. The loss was listed as \$9 million to the structure and \$1.5 million to the contents.

Basic Industry, Utility Properties

Alaska

\$20 million

December, 10:43 p.m.

This fire involved a refractory tower in an oil refinery. No information was reported on the tower's height, ground floor area, construction, operating status, or fire protection systems.

The fire, the cause of which was undetermined, broke out in the tower's crude oil piping.

Two refinery fire brigades and a local fire department responded. At the time of the fire, the weather was bitterly cold, with winds of 30 to 50 miles (48 to 80 kilometers) per hour, gusts up to 85 miles (137 kilometers) per hour, and a wind chill of -15 to -45oF (-26 to -43oC).

Educational Properties

Texas

\$14 million

May, 7:44 p.m.

This five-story university administration building was of heavy-timber construction. The building also contained classrooms, faculty offices, and dorm rooms. The ground-floor area was not reported. The building was occupied at the time of the fire.

Information on the structure's automatic detection equipment was not reported. It had no automatic suppression equipment.

An electrical malfunction ignited wood structural members between the top-floor ceiling and roof, and the fire spread rapidly through the attic and top floors. After a primary search of all floors, firefighters were ordered out of the structure to begin a defensive attack.

The loss was estimated at \$12 million to the structure and \$2 million to its contents.