

**SPRINKLER PERFORMANCE WAS LESS THAN OPTIMAL  
OR  
SPRINKLERS COULD NOT HAVE BEEN  
EXPECTED TO CONTROL THE FIRE**

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## NOT IN AREA PROTECTED

### Propane gas grill fire spreads from apartment balcony - Wisconsin

A propane gas grill on a fourth-floor balcony leaked fuel, which ignited, and the resulting fire spread to the apartment building roof.

The four-story building, constructed of wood framing with a brick veneer, housed several apartments on the second, third, and fourth floors. Retail businesses were located on the first floor, and there was a parking garage in the basement. Smoke alarms were installed throughout, and there were heat detectors in the attic and mechanical rooms. Manual pull stations were located on every floor. A residential wet-pipe sprinkler system installed in compliance with NFPA 13R, *Installation of Sprinkler Systems in Residential Occupancies Up To and Including Four Stories in Height*, was operational at the time of the fire.

The fire began when the occupant of the fourth-floor unit started a propane grill on her balcony in preparation for cooking. She had only had the grill for about a month and had difficulty lighting the grill due to a faulty igniter switch. To start the grill, she resorted to either matches or lighted pieces of paper.

As she waited for the grill to warm up, the woman got a phone call and after five minutes shut off the grill. When she returned 45 minutes later, she restarted the grill again using a match when the igniter didn't work. Once the fire was going, however, she noticed flames near the neck of the propane cylinder. Although she immediately turned the burners off, the fire still burned at the cylinder. The woman called 911 to report the fire, then returned to the balcony to find that the fire had spread to the floor.

The woman tried to control the fire, but the flames continued to spread, so she left the apartment with her 4-year-old son. On the way out, she told occupants of the building she met in the stairwell about the fire but failed to activate a pull station that would have alerted the entire building.

Attempts by two occupants to control the fire with a portable extinguisher knocked down about 70 percent of the blaze, but failed to extinguish the flames that soon reached the ceiling of the balcony.

Responding to the 7:13 p.m. call, firefighters found fire on the top floor. Shortly after their arrival, they saw fire rolling across the fourth-floor ceiling. They later discovered fire in the eaves, but didn't realize fire was in the attic above them. Then firefighters discovered there was no standpipe connection available, they lowered ropes from a fourth-floor window and pulled a hose line up.

A second alarm was sounded as firefighters fought for more than two hours to control the fire.

Investigators determined that the fire began when a propane gas leak was ignited by the grill's burners. The fire then spread to combustible wood framing and roof supports, through the vinyl and aluminum covered soffits.

The residential sprinkler system in the apartment operated, but the fire spread in the attic. Eventually, the ceiling collapsed. Fire spread from the deck into the fourth floor was reduced by the sprinkler system, which didn't extend to the attic and roof.

The building suffered a \$2 million loss. There were no injuries during the fire.

Kenneth J. Tremblay. 2000. Firewatch. *NFPA Journal*, July/August, 18.

## **Neon signs ignite wood siding in strip mall: Arkansas**

Flames traveled along a strip mall's open exterior façade before firefighters extinguished it. Although sprinklers and a fire wall kept the flames from entering the main building, damage was estimated at nearly \$1 million.

The 15 retail stores in a single-story shopping center were of wood-frame construction. Each store had an individual fire detection system, and a wet-pipe sprinkler system had been installed throughout the building. The stores were closed for the night when the fire broke out.

A passerby discovered the blaze and called 911 on his mobile phone at 1:50 a.m. When firefighters arrived, they found the façade engulfed in flames and used a deck gun to extinguish the blaze. The wood-frame façade was sheathed in wood siding and affixed with a neon sign for each occupancy. Unfortunately, it was open from one end to the other with no separation.

The fire heavily damaged the facade, although three sprinklers and a fire wall kept flames from entering the stores. Investigators determined that one of the neon signs, which had recently been replaced, short circuited and ignited the siding.

The building, which had an estimated value of \$750,000, suffered \$650,000 in damage. Damage to the contents, valued at \$300,000, came to \$250,000.

Kenneth J. Tremblay. 2000. Firewatch. *NFPA Journal*, September/October, 23.

<b>Location, Dollar Loss, Date, Time</b>	<b>Property Characteristics and Operating Status</b>	<b>Fire Protection Systems</b>	<b>Fire Development</b>	<b>Contributing Factors</b>
Illinois \$15,000,000 August 19, 1999 5:47 a.m.	This one-story warehouse for palletized cardboard cartons was of unprotected ordinary construction with a ground floor area of 140,000 square feet (13,006 square meters). When the fire broke out, the plant was closed.	The plant didn't have any automatic detection equipment. It did have a complete coverage wet-pipe sprinkler system, which activated and sounded an alarm. The sprinklers were ineffective, however, because the fire spread above the sprinkler heads.	The fire originated at ceiling level above the sprinklers system and spread through the wood truss roof. The cause was undetermined. Firefighters initiated an offensive attack. While venting the roof, firefighters found it to be spongy and evacuated the entire building. Soon after the roof collapsed. No injuries were reported.	The collapsing roof broke cross feeds to the sprinkler system. The open truss area contributed to the fire spread.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 88.				
Wisconsin \$5,000,000 September 28, 1999 6:11 p.m.	This one-story wood product manufacturing plant was of protected, ordinary construction and covered a ground-floor area of 100,000 square feet (9,290 square meters). The plant was in operation at the time of the fire.	The plant had no automatic detection equipment but did have a complete coverage wet-pipe sprinkler system. Although the sprinklers operated and sounded an alarm, they were ineffective because the fire started above them.	Workers performing roofing operations ignited a small fire in the roofing materials. The workers thought they completely extinguished the fire and left the area two hours later. A fire broke out approximately one hour later in the Styrofoam insulation between the upper and lower plywood roof decks. Firefighters initiated an interior attack on the fire until conditions deteriorated and they withdrew to a defensive attack. One firefighter was injured.	Fire department notification of the initial fire was delayed almost three hours. The water supply in the area was limited. Firefighters had trouble getting to the fire building. Railroad tracks on one side of the building and a lake on two other sides limited firefighters accessibility to only one side.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 88.				

## SHUT OFF

### School fire spreads due to sprinkler shut-off - California

Fire heavily damaged an unoccupied school, because the water supply to the sprinkler system was shut off, allowing the fire to spread to the attic.

The single-story, wood-framed elementary school, which was 60 feet (18 meters) by 60 feet (18 meters), contained five classrooms, two work rooms, two bathrooms, and two mechanical rooms. The building had a peaked roof with a skylight in the middle. Although the property had sprinklers, the building's well, which supplied its water, was shut-down due to dirt in the system. There was also no fire detection system.

When neighbors saw smoke from the school at 7:07 p.m., they called 911 and activated the fire alarm on the building. Nine minutes later, arriving firefighters found smoke and flames coming from the roof and fire at one end of the interior hallway. They stretched hoselines to the building, entered, and began extinguishment.

Several fire companies coordinated a fire attack and ventilation strategy to extinguish the blaze, which had spread to the attic and roof before it even damaged the classrooms below.

One of the building's heating units was found within inches of the wall of origin. No other potential heat sources were found in the area.

Because there was no detection system or operating sprinkler system, the fire burned undetected into concealed spaces.

The structure, valued at \$1 million, sustained an estimated \$400,000 in direct property damage. Contents were valued at \$150,000 and sustained \$60,000 in damage.

Kenneth J. Tremblay. 2000. Firewatch. *NFPA Journal*, July/August, 20.

<b>Location, Dollar Loss, Date, Time</b>	<b>Property Characteristics and Operating Status</b>	<b>Fire Protection Systems</b>	<b>Fire Development</b>	<b>Contributing Factors</b>
North Carolina \$7,600,00 March 28, 1999 2:02 a.m.	This one-story knitting and finishing facility of unprotected noncombustible construction covered a ground-floor area of 46,500 square feet (4,320 square meters). At the time of the fire, the plant was in full operation.	No information was reported on automatic detection equipment. The facility had a wet-pipe sprinkler system that operated with 432 heads. A firewall separated this mill from an adjoining one. The fire doors prevented fire spread into the second building. Employees used extinguishers to no avail.	Someone saw sparks falling from a fluorescent light fixture near one of the machines. Firefighters fought the fire until they believed it was extinguished. At this point, they shut down the sprinkler system. The fire soon broke out again, and fire spread rapidly before the valve could be reopened. The system couldn't control the fire at this point.	Premature shutting of the sprinkler system contributed to the fire damage.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 85.				
Colorado \$15,000,000 April 23, 1999 2:58 p.m.	This two-story single-family home had a ground-floor area of more than 5,000 square feet (464 square meters). The type of construction wasn't reported. No one was home when the fire broke out.	The house had an automatic detection system of unknown type and coverage, which operated. It also had a residential set-pipe sprinkler system, but it had been shut down during remodeling.	A light fixture in a closet ignited structural members. No details on the fire's subsequent growth and spread were reported. No injuries were reported.	None reported.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 93.				
Massachusetts \$10,000,000 June 24, 1999 3:37 p.m.	The warehouse in which the main losses occurred was in an old mill complex and stored new commercial dryers. The ground-floor area wasn't reported. The building in which the fire originated was a vacant one-story structure of unprotected, wood-frame construction.	No information was reported on automatic detection equipment. The warehouse's sprinkler system had been shut down before the fire.	Investigators believe that smoking materials caused the fire, which started in grass outside. The fire spread to a wood-frame dye house then to the warehouse. More than 250 firefighters responded from 24 cities and towns. Crews managed to contain the fire to approximately half the complex.	If the sprinkler system hadn't been shut down, it could have extinguished the fire in its incipient stage.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 88, 90.				

<b>Location, Dollar Loss, Date, Time</b>	<b>Property Characteristics and Operating Status</b>	<b>Fire Protection Systems</b>	<b>Fire Development</b>	<b>Contributing Factors</b>
Oregon \$13,522,500 August 19, 1999 4:13 a.m.	This five-story apartment building with businesses on the lower level was under construction at the time of the fire. It was of protected, wood-frame construction and covered a ground-floor area of more than 50,000 square feet 4,645.0 square meters). There was no one at the site when the fire broke out.	No information was reported on automatic detection equipment. The building had a wet-pipe sprinkler that had been shut down during construction.	The only information reported was that this was an incendiary fire. No injuries were reported.	None reported.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 95.				
Washington \$7,000,000 December 28, 1999 3:23 a.m.	This 12-foot (3.7 meter) retail tool store was of unprotected, ordinary construction with a ground-floor area of 102,000 square feet (9,475.8 square meters). The store of origin, which was one of six businesses in the strip mall, covered a ground-floor area of 32,400 square feet (3,010 square meters). The store was closed.	No information was reported on automatic detection equipment. The entire strip mall had a shared wet-pipe sprinkler system, which had been disabled in the store of origin by a prior forklift incident. The sprinkler in the adjoining business helped control fire spread. There was also a dry-pipe system in a dry storage area.	Cardboard boxes containing plastic tarps failed and fell from rack storage, landing within a foot (.03 meters) of a heater. The propane heater was set up to help dry out the stock made wet by the sprinkler incident earlier in the day. The heater ignited the boxes and the blower pushed the burning embers into other storage. No injuries were reported.	With the sprinkler system disabled, there was no water flow alarm to notify the fire department, allowing the fire to burn a long time before the neighboring business' sprinkler activated.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 91.				

## **INOPERATIVE**

### **Delayed alarm leads to \$2 million loss - Texas**

A plastic manufacturing plant was completely destroyed when a cutting torch ignited cardboard, plastics, and other trash, and the fire spread rapidly to storage. A delay in fire department notification and a disabled sprinkler contributed to the huge loss.

The two-story plant had a steel frame, with a metal deck roof and masonry walls. It was 200 feet (61 meters) long and 400 feet (122 meters) wide. A wet-pipe system was inoperable, and its owners had been issued a notice to repair by fire officials. There were no smoke alarms, and the building was operating at the time of the fire.

Employees were using a cutting torch to remove a metal gate and overhead door assembly on a loading dock when the torch came into contact with the combustible trash. The resulting fire spread quickly while the employees tried to control it with hand-held extinguishers before calling the fire department.

The department received a 911 call from the plant manager at 10:35 A.M. Arriving 2 ½ -minutes later, the first company saw “a wall of fire” at one corner of the building.

Two firefighters and two civilians were injured during the incident. The structure, valued at \$1 million, and contents, valued at \$1 million, were a total loss.

Kenneth J. Tremblay. 2000. Firewatch. *NFPA Journal*. May/June, 38.

## EXPLOSION

Location, Dollar Loss, Date, Time	Property Characteristics and Operating Status	Fire Protection Systems	Fire Development	Contributing Factors
Texas \$20,000,000 June 23, 1999 11:29 a.m.	This three-story plastics manufacturing plant was of open steel frame construction. The ground-floor area wasn't reported. The plant was operating when the fire broke out.	There was no information reported on automatic detection systems. The plant had a partial coverage deluge sprinkler system that operated and successfully contained the fire.	An unknown source ignited a leak of a flammable liquid, butadiene, causing an explosion and fire. Two civilians suffered fatal burns, and four were injured.	None reported.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 84.				

## WRONG TYPE OF SYSTEM

<b>Location, Dollar Loss, Date, Time</b>	<b>Property Characteristics and Operating Status</b>	<b>Fire Protection Systems</b>	<b>Fire Development:</b>	<b>Contributing Factors</b>
Georgia \$7,300,000 March 10, 1999 1:23 p.m.	This two-story general storage warehouse of protected noncombustible construction covered a ground-floor area of 75,000 square feet (6,967.5 square meters). The warehouse was operating at the time of the fire.	The warehouse didn't have an automatic detection system. It did have a wet-pipe sprinkler system, but its coverage wasn't known. The system operated but wasn't effective because it hadn't been maintained well and because it wasn't designed for the commodities stored.	Because investigators believe that toxic materials were present, they suspended investigation of this fire before determining a cause. The fire broke out in an unoccupied area. With a rapid fire spread due to 700 to 1,000 tons (635 to 907.2 metric tons) of group A plastics and a delay in notifying the fire department, an interior fire attack wasn't possible. By the time the fire department arrived, flames had consumed 100 feet (30.5 meters) of the building. No injuries were reported.	The sprinkler system was poorly maintained and not appropriate for the commodities stored. It took awhile for someone to discover the fire because it started in a remote, unoccupied area. The person who discovered the fire called others in the building before notifying the fire department.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 88.				
Pennsylvania \$6,000,000 August 11, 1999 5:57 p.m.	This approximately 50-foot (15.2 meters) steel manufacturing building was of unprotected, noncombustible construction with a ground-floor area of 20,000 square feet (1,858 square meters). Although the plant was closed for the night, maintenance workers were inside.	The plant didn't have any automatic detection equipment, but it did have a partial coverage wet-pipe sprinkler system. The sprinklers were ineffective because of missing heads and the fact that the system wasn't designed for this hazard. The system outside the area did help stop the fire spread.	Investigators haven't determined the cause of this fire, but they believe it started in a dip-tank area. Six firefighters were injured fighting the blaze.	The poorly maintained sprinkler system wasn't designed for the hazard involved, and heads were missing.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 85-86.				

## SYSTEM COMPONENT DAMAGE

<b>Location, Dollar Loss, Date, Time</b>	<b>Property Characteristics and Operating Status</b>	<b>Fire Protection Systems</b>	<b>Fire Development</b>	<b>Contributing Factors</b>
Michigan \$650,000,000 February 1, 1999 1:00 p.m.	This six-story power plant at an automobile manufacturing complex was of protected, noncombustible construction and covered a ground-floor area of 80,874 square feet (7,513.2 square meters). The plant was in full operation at the time of the explosion and ensuing fire.	The power plant didn't have automatic detection equipment. There was a partial area coverage wet-pipe sprinkler system. The areas covered weren't reported. This system did activate but wasn't able to contain or extinguish the fire due to the extreme circumstances and damage to the system by the explosion and fire.	A build-up of natural gas in a boiler was ignited by an undetermined source. The explosion heavily damaged the building. Six civilians died in the blast and another 38 were injured.	According to investigators, several safety devices were removed or inoperative.
Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i> , November/December, 95-96.				

<b>Location, Date, Time of Alarm, Number of Deaths</b>	<b>Occupancy Type and Use, Construction Type, Number of Stories, and Operating Status</b>	<b>Detection Systems</b>	<b>Suppression Systems</b>	<b>Fire Origin and Path</b>	<b>Contributing Factors</b>
Michigan November 10, 1999 9:00 p.m. Five	Convalescent home; protected ordinary construction; one story; full operation.	The building had smoke alarms and heat detectors throughout.	The wet-pipe sprinkler system in the basement was destroyed in the explosion.	The fire started in the boiler room. A small initial explosion was followed by another. Other details of the ignition remain undetermined.	The occupants had no time to react to the explosion.
Robert S. McCarthy. 2000. 1999 Catastrophic Multiple-Death Fires. <i>NFPA Journal</i> , September/October 59.					

## LACK OF MAINTENANCE

<b>Location, Dollar Loss, Date, Time</b>	<b>Property Characteristics and Operating Status</b>	<b>Fire Protection Systems</b>	<b>Fire Development</b>	<b>Contributing Factors</b>
<p>California \$6,000,000 July 2, 1999 7:25 p.m.</p>	<p>This four-story furniture showroom of protected, non-combustible construction covered a ground-floor area of approximately 44,000 square feet (4,087.5 square meters). The showroom was closed but construction workers were in the building.</p>	<p>The building had no automatic detection system but did have a partial-coverage sprinkler system. Sprinklers helped control fire spread on the second and third floors but weren't effective on the fourth floor because of sediment in the system. Firefighters found sediment blocking several heads. The building also had portable extinguishers and a stand pipe system. Investigators believe that workers used the extinguishers.</p>	<p>Molten slag came in contact with furniture during welding operations and ignited a fire. The fire spread out the second-floor windows and into the third floor. Flames then breached a ceiling and entered the fourth floor where there was a flashover. No injuries were reported.</p>	<p>Sediment blocked sprinklers on the fourth floor.</p>
<p>Stephen G. Badger and Thomas Johnson. 2000. 1999 Large-Loss Fires and Explosions. <i>NFPA Journal</i>, November/December, 92.</p>				

**NO SYSTEM**

<b>Location, Date, Time of Alarm, Number of Deaths</b>	<b>Occupancy Type and Use, Construction Type, Number of Stories, and Operating Status</b>	<b>Detection Systems</b>	<b>Suppression Systems</b>	<b>Fire Origin and Path</b>	<b>Contributing Factors</b>
Michigan February 1, 1999 1:00 p.m. Six	Industrial power plant; unprotected non-combustible construction; six stories; full operation.	None.	The power plant had a partial wet- pipe sprinkler system.	An undetermined source ignited an accumulation of natural gas in a boiler.	According to the state OSHA report, several safety devices at the plant had been defeated or removed, and there were no written procedures posted for shutting down the boiler. Sprinklers were unable to control the fire caused by the explosion. Thirty- eight workers were injured in the blast.
Robert S. McCarthy. 2000. 1999 Catastrophic Multiple-Death Fires. <i>NFPA Journal</i> , September/October, 59.					