How did the fire in the Haunted Castle start? Why were eight teenagers unable to reach safety? How could fire protection and early warning systems have helped to avert this disaster? Presented here is the incident itself, the strategy and tactics used to fight this fire, what the preliminary investigations uncovered, and recommendations to prevent recurrence of such an event.

The Fire
BY WILLIAM J. COMER

Friday, May 11, 1984, was the day of the tragic holocaust that claimed the lives of eight teenagers and injured a dozen others at the Six Flags Great Adventure amusement park in Jackson Township, NJ. This was also a day of disgrace for fire protection code enforcement officials everywhere.

The Haunted Castle, a ghostly house filled with flammable exhibits and actors dressed as ghouls, was constructed of sevenъen 8 x 8-foot linked truck trailers with a false facade made to look like a castle with archways and a moat. The complex of truck trailers was arranged in an "H" pattern, eight trailers on each side and a control trailer in the center. Only one eight-trailer section was in use at the time due to a light attendance at the park. The floors, walls, and ceilings were lined with plywood. Some of the walls were partitioned with 2 x 4-inch wood stud walls covered with plywood paneling to form the maze. Exhibits were constructed of wood and covered with foam rubber. Some of the walls were covered with a foam cellular plastic to add realism to the exhibits and to protect people from injury. Each trailer was air conditioned with an exterior three-ton unit equipped with large circulating air fans.

Fire department operations
The fire was discovered by an employee assigned inside the maze. He smelled smoke, but thought it was from a cigarette. Checking further, he saw smoke coming from the phantom exhibit. He immediately went to the control center trailer where he called in the alarm to the security office. In about four minutes, flame was showing at the top and rear of the trailer.

The Great Adventure fire battalion was dispatched at 6:35 p.m. and responded with two pieces of fire apparatus manned by two men. With the help of other employees, the brigade was able to stretch four 1-inch handlines. Employees were instrumental in assisting several patrons from the Haunted Castle.

The facility's fire alarm was supervised and automatically transmitted to the local fire department. The Jackson Township Fire Department received the alarm at 6:41 p.m. Jackson Mills and Cassville Fire Departments also responded.

While enroute to the incident, Chief John Kebbeck of the Cassville Fire Department tried to get a progress report from radio. However, heavy traffic on the fire radio prevented him from getting through. Being resourceful, he used his work band radio to call home and had his wife telephone the police dispatcher. Mrs. Kebbeck relayed the information that the fire was in the Haunted Castle.

On April 1, 1984, the Cassville Fire Department conducted a drill at the Haunted Castle. Among the many fire plans formulated at this drill, it was determined that if a fire did occur at the Haunted Castle, it would require a four fire department response.

Chief Kebbeck ordered this pre-fire plan to be activated, thereby increasing the responsibility of water control and supply. There were no water problems on the fire ground. Two hydrants were used and ample tankers were available.

On his arrival at the fire, Chief Kebbeck received a report that all occupants had been evacuated. Disregarding this, search operations were continued. Initial size-up indicated that the fire was being fed from the rear of the row of trailers. It was later reported that fire from the attraction's air circulating fans were operating at the rear of the trailers and contributing to the velocity of the fire.

An interior offensive attack was the initial strategy, but the amount of fire combined with the collapse of ceiling near the entrance forced all units outside to assume defensive operation. Eight 1-inch and eight 1/2-inch lines were employed. A fence to the rear of the...
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The Haunted Castle, a ghoulish house filled with flammable exhibits and actors dressed as ghouls, was constructed of seven neon 78-foot lighted truck trailers with a false facade made to look like a castle with archways and a moat. The complex of truck trailers was ar ranged in an "H" pattern, eight trailers on each side and a control trailer in the center. Only one eight-trailer section was in use at the time due to a light attendance at the park. The floors, walls, and ceilings were lined with plywood. Some of the trailers were partitioned with 2 X 4-inch wood paneling covered with plywood paneling to form the maze. Exhibits were constructed of wood and covered with foam rubber. Some of the walls were covered with a foam cellular plastic to add realism to the exhibits and to protect people from injury. Each trailer was air conditioned with an exterior three-ton unit equipped with large circulating air fans.

Fire department operations

The fire was discovered by an employee assigned inside the maze. He smelled smoke, but thought it was from a cigarette. Checking further, he saw smoke coming from the phantom exhibit. He immediately went to the control center trailer where he called in the alarm to the security office. In about four minutes, flame was showing at the top and rear of the trailer.

The Great Adventure fire brigade was dispatched at 6:35 p.m. and responded with two pieces of fire apparatus manned by two men. With the help of other employees, the brigade was able to stretch four 1½-inch lines. Employees were instrumental in assisting several patrons from the Haunted Castle.

The facility's fire alarm was supervised and automatically transmitted to the local fire department. The Jackson Township Fire Department received the alarm at 6:41 p.m. Jackson Mills and Cauville Fire Departments also responded.

While enroute to the incident, Chief John Kebock of the Cauville Fire Department tried to get a progress report on radio. However, heavy traffic on the fire radio prevented him from getting through. Being resourceful, he used his work band radio to call home and had his wife telephone the police dispatcher. Mrs. Kebock relayed the information that the fire was in the Haunted Castle.

On April 1, 1984, the Cauville Fire Department conducted a drill at the Haunted Castle. Among the many pre-fire plans formulated at this drill, it was determined that if a fire did occur at the Haunted Castle, it would require a four fire department response.

Chief Kebock ordered this pre-fire plan to be activated, thereby increasing the responding units to eight pumpers and two tankers (one 8,500 gallons and one 5,000 gallons).

The Fire Wood Acres Fire Department responded with a tanker and was assigned the responsibility of water control and supply. There were no water problems on the fireground. Two hydrants were used and ample tankers were available.

On his arrival at the fire, Chief Kebock received a report that all occupants had been evacuated. Disregarding this, search operations were continued. Initial size-up indicated that the fire was being forced from the rear of the row of trailers. It was later reported that four of the attraction's air circulating fans were operating at the rear of the trailers and contributing to the velocity of the fire.

An interior offensive attack was the initial strategy, but the amount of fire combined with the collapse of flooring near the entrance forced all units outside, where defensive operations began. Eight 2½-inch and eight 1½-inch lines were employed. A fence to the rear of the Haunted Castle as seen from the maze layout, the victims appear to have been isolated from paths to the exits by the rapidly spreading fire conditions. They were trapped in a "loop" that took them closer to the seat of the fire no matter which direction they chose.

The Haunted Castle

As seen from the maze layout, the victims appear to have been isolated from paths to the exits by the rapidly spreading fire conditions. They were trapped in a "loop" that took them closer to the seat of the fire no matter which direction they chose.
The fire quickly involved the entire complex. Several holes were cut in the sides of the trailers in order to place lines directly on the fire. Most of the fire was through the roof, subsequently consuming the trailers involved.

When conditions permitted, a thorough secondary search was conducted. The bodies of the eight trapped victims were located at that time. They were found in a loop section of the maze.

The teenagers didn't have much of a chance to escape the fast toxic buildup of copious amounts of heated black smoke followed by a fast flame spread from both the rear and the front due to the loop in the maze.

This fire should never have happened. In fact, the Haunted Castle should never have been built. It was constructed without a building permit and a certificate of occupancy was never issued. The structure was subject to the state's uniform construction code that, among other things, requires smoke detectors and a review by the state and a professional plan reviewer.

The use of truck trailers linked together to form the Haunted Castle and the placement of large loads of flammable materials in them was a major factor contributing to the fast fire spread. Polyurethane foams, under the proper conditions, are capable of propagating flames at a very high rate because they have a high heat release rate due to having a low thermal inertia. These foamed plastics have the propensity to generate large amounts of black smoke and toxic gases, including carbon monoxide, hydrogen cyanide, phosgene and nitrous oxides.

The small size of the truck trailers, made smaller by the addition of partitions to form a maze, set up conditions for a flashover. The plywood walls, ceiling, and floor covering, along with the sprayed-on foam, would reach flashover point rapidly due to the pyrolysis of the combustibles and the sensitivity of the radiant thermal feedback in the confined space.

Another major factor contributing to rapid flame spread was the four large, circular fans.

At press time, a grand jury investigation, called by Prosecutor Edward J. Turnbach of Ocean City, NJ, was under way. The chairman of the Senate Law, Public Safety and Defense Committee, called for statewide meetings to be conducted by the New Jersey State Fire Safety Commission. These meetings are analyzing all existing state agency requirements pertaining to the uniform construction code, and making needed revisions for new legislation that would prevent the recurrence of the Haunted Castle fire or similar tragedies.

Proper safety code enforcement, especially in an amusement park attraction filled with "phantoms" and optical illusions, is mandatory for preventing a recurrence of New Jersey's Haunted House tragedy.

The Building Official and Code Administration (BOCA) Basic Building Code, the BOCA Basic Fire Prevention Code, and the National Fire Protection Association's Life Safety Code all prescribe construction, protection, and occupancy features to minimize danger to life from fire, smoke, fumes, or panic during a fire incident.

The following features, as well as a study of people activities, should be incorporated into a building designed for such an occupancy as the Haunted Castle:

- Smoke detectors.
- Sprinkler systems equipped with a central station signaling system.
- Emergency lighting to conform to the national electrical code.
- Exit signs with supplemental directional signs designating the direction of egress.
- Interior finish and furnishings in all means of egress should be Class A (flame spread 0 to 25).
- Employees and attendants should be schooled in their duties in case of fire, smoke, panic, or other emergencies in order to expedite the evacuation of all occupants.
- Fire brigades must be adequately manned. Two or three men do not make a fire company. An improperly manned and ill-trained fire brigade responding first due to an incident will only add to the delay of the fire attack and cause unnecessary confusion.
- The number of exits must be adequate and maintained in an adequate condition at all times for a steady flow of all occupants to safety.
- Manual shut-off for air conditioning or ventilating systems. The shut-off must be easily identified and located where it is readily accessible to the fire department, perhaps in the same location as recommended for smoke detectors.
- Automatic smoke vents in the roof.
- Eliminate loops in corridors that create dead end areas where fire could seal off means of egress at both ends of a loop.
- Remove rubber tires from trailers that are occupied by people. These tires are difficult to extinguish when on fire, and produce large volumes of smoke.
- Use of cellular plastic foam, even when treated with a fire retardant, should not be used as an interior finish in buildings classified as public assembly areas.
- Truck trailers or similar type containers that would set up a flash- or flash-like atmosphere when subjected to fire, smoke, or toxic fumes should not be used for public assembly areas.
- Plywood should not be used as interior finishes on walls, floors, and ceilings without an approved thermal barrier such as gusset wallboard. (Some plywood is extremely flammable and easily subjected to breaks and tears are exposed surface areas, making for a more readily ignitable material.)

Safety Feature Recommendations

FIRE ENGINEERING

"A rubber coat would have melted, and canvas would have burned."

Turnout coats made of DuPont’s NOMEX III aramid fiber save firefighters’ lives. Just ask firefighter Mike Moens. He’s convinced he’s alive today because NOMEX protected him in a situation far too intense for other materials.

Responding to a routine smoke-showing call, Moens, wearing turnout gear and self-contained breathing apparatus, entered a room filled with carbon monoxide. Suddenly, a fireball erupted with such force that an entire 6×10-foot section of wall blew out in a single piece. Moens was knocked over. But he was protected from potentially fatal burns by his turnout coat, made of NOMEX III.

As a result, Chief David Russell specifies turnout coats with shells, quilted liners and vapor barriers all made of NOMEX III. Hoods and gauntlets, too.

DuPont makes NOMEX® aramid fibers, not garments.

Firefighter Mike Moens, Fairfield Fire Department, Fairfield, Connecticut

From left to right, the rear of the spider, Frankenstein, and straw room trailers (the latter being the point of fire origin) show the effects of the heat generated. The air circulating units that intensified the fast-moving fire are located in the foreground.

NOXME III offers a better combination of toughness, light weight, flame resistance, and thermal insulation than other materials. And it won’t rot like cotton, or melt or drip like polyester and nylon.

Get maximum firefighting protection. Specify turnout clothing made of NOMEX III from your supplier. For his name and more information about NOMEX III, write: Du Pont Co., Room G39066, Wilmington, DE 19898.

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For more facts Circle 124 on Reply Card
The Haunted Castle at Six Flags Great Adventure amusement park in Jackson Township, N.J., was designed specifically to scare people. It contained gruesome displays that remained unchanged until you approached. There were spider webs hanging down that made your skin crawl.

On Friday, May 11, 1984, the amusement park had an average crowd of 13,000 people. There was a line of people waiting to get in the Haunted Castle, and employees were allowing approximately 10 people to enter the castle per minute. The average time to get through this attraction from entrance to exit is approximately three minutes. At any given time, there are between 30 and 45 persons within the castle.

The castle was made up of 17 trailers, each 8 x 40 feet with partitions down the middle. Fifteen of these trailers were box trailers and two were open flatbed trailers. The trailers were of no special make or model. A few contained the side hinged door and others had the overhead roll type. The front of the castle was a framed structure with molded polyurethane-type foam sprayed on and then painted. The frame facade stood about 45 feet high.

The castle consisted of two identical sides, each having eight trailers. The seventeenth trailer was used as a control room for the employees, where they put on their makeup and costumes. It contained the electric panels for both sides of the attraction as well as tables and chairs, lockers, a telephone, and two fire extinguishers.

All the trailers were connected together by means of plywood and wood framing. The space between each of the trailers was about eight inches.

On the night of May 11, only one side was open to the public. There were four employees, dressed as goblins, on duty. At approximately 6:30 p.m., an employee, positioned at the butcher station (see map), thought he smelled smoke. This was a usual occurrence. The employee was accustomed to telling guests to put out their cigarettes. A week before, someone had set off a smoke bomb. He went to check. An employee passed through the butcher section and the phantom of the opera station.

As he entered the opera station, he observed heavy smoke coming from the phantom area. He then proceeded back through to the butcher station to the front gate to tell the other employees not to let anyone enter and that he thought there was a fire in the castle. He then re-entered the control room, dialed a Great Adventure fire brigade, and told them of the fire (this was minutes after detecting smoke). He exited via the control room door. Looking to his right, he saw smoke in flames around the exit door from the street room.

Meanwhile, an adult guest discog to the castle and told an employee that there was a fire inside. This guest was a major witness in helping to determine the point of fire origin.

The Great Adventure fire brigade was manned by a captain and a firefighter. As the chief left the fire station, he wanted to see that there was a working fire. He radioed security to notify the Jackson Police Department to enact a mutual aid plan.

An offensive initial attack was made with a 2½-inch line through the front door. The captain was met with hot smoke, and flame rolling over his helmet within 30 feet of entering the castle. He decided to retreat and attack the fire from the rear trailers.

The regular police dispatcher was on duty, and when the alarm was received at 6:41 p.m. The relief driver dispatched Stations 54 and 56 to Great Adventure. The mutual aid plan called for Stations 54, 55, 56, and 57 to respond.

The first mutual aid company, located four miles from the amusement park, arrived 11 minutes after receiving the alarm. The company was directed to respond through the employees' gate and to come around behind the castle. A second mutual aid company, located 15 miles from Great Adventure, arrived on the scene at 6:56 p.m. Additionally, mutual aid companies were brought in from a total of 15 companies to the incident.

Arriving fire companies encountered some difficulty getting to the fire scene because of civilian congestion. Security directed some of the fire companies to take up positions in areas other than their assigned pre-planned areas. A mutual aid drill had been conducted on the Haunted Castle a month before the incident. Security personnel were not active participants in that drill.

Great Adventure has its own water supply, maintained by the Jackson Municipal Utilities Authority. There is one million-gallon storage tank at ground level. This is supplied by water pumps from the artesian wells. The water demand was not great enough during the initial attack for the pumps to kick on automatically; security had to turn them on.

The initial attempt to fight this fire in the offensive mode, the strategy was changed to a defensive mode. Not until the fire was knocked down was it an attempt to re-enter the trailer. It was at this time that the fatalities were discovered. Firefighters were unsure as to whether they were masskins or human remains. The officer in charge ordered that all remains be treated as human, that nothing be touched or removed, that firefighting procedures continue throughout the rest of the castle, and that every firefighter continue to look for signs of other fatalities.

It was at this time that, according to standard operating procedures in the event of a fatality, all necessary agencies were notified to respond to the fire at Great Adventure.

The County Fire Marshal's Office, the County Prosecutor's Office, and the Arson Squad from the New Jersey State Police spearheaded the investigation in the cause and origin of the fire. Teams were set up and assigned the task of collecting information. It was through the use of this information that the exact point of origin was established.

Upon first investigation, two low burn patterns, remote from each other, made it appear as two separate points of origin. Further investigation disclosed that the fire had spread from one set of trailers to the other. The heat damage that occurred was extensive, accentuating the point of origin.

It was determined that the stove room contained a pad of polyurethane foam to prevent injuries to the walls. It was also determined that the stove light was made of the day. It was ordered to have the pad removed and the stove continued.

A very common practice was for the guests to lighters to see where they were located. The employees were instructed against carrying matches. On the night of the 16-year-old was using matches. He accidentally walked on the stove room while walking. He attempted to get his canvas bag, was unsuccessful, and apparently continued to walk.

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On Friday, May 11, 1984, the amusement park had an average crowd of 15,000 people. There was a line of people waiting to get in the Haunted Castle, and employees were allowing approximately 10 people to enter the castle per minute. The average time to get through this attraction from entrance to exit is approximately three minutes. At any given time, there are between 30 and 45 persons within the castle.

The castle was made up of 17 trailers, each 8 x 40 feet with partitions down the middle. Fifteen of these trailers were box trailers and two were open flatbed trailers. The trailers were of no special make or model. A few contained the side hinged type doors and others had the overhead roll type. The front of the castle was a framed structure with molded polyurethane-type foam covering.

The frame facade stood about 45 feet high.

The castle consisted of two identical sides, each having eight trailers. The seventeenth trailer was used as a control room for the employees, where they put on their makeup and costumes. It contained the electric panels for both sides of the attraction as well as tables and chairs, lockers, a telephone, and two fire extinguishers.

All the trailers were connected together by means of plywood and wood framing. The space between each of the trailers was about eight inches.

On the afternoon of May 11, an outside area was open to the public. There were four employees, dressed as ghosts, on duty. At approximately 6:30 p.m., an employee, positioned at the buttock station (see map), thought he smelled smoke. It was a usual occurrence. The employee was accustomed to telling guests to put out their cigarettes.

A week before, someone had set off a smoke bomb. He went to check. An employee panicky connected the buttock station and the phantom of the opera station.

The employee went through the passageway, observed heavy smoke coming from the phantom area. He then proceeded back through the buttock station to the front gate to tell other employees not to let anyone else in and that there was a fire in the castle. He then re-entered the control room, dialed the Great Adventure fire brigade, and notified them of the fire. He then exited the control room door.

Looking to his right, he saw smoke and flames around the door of his own room.

Meanwhile, an adult guest discovered the fire ran through the remainder of the castle and told an employee that there was a fire inside. This was a major witness in helping to determine the cause of fire origin.

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As the engine left the fire station, the captain saw that they had a worthwhile fire.

He radioed security to notify the Jackson Police Department to enact the mutual aid plan.

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He decided to retreat and attack the fire from the rear trailers.

The regular police dispatcher was on duty when the alarm was received at 6:41 p.m. The relief dispatcher dispatched Stations 54 and 56 to Great Adventure. The mutual aid plan was activated and Stations 54, 55, 56, and 57 responded.

The first mutual aid company, located four miles away, arrived back to the company area at 11 minutes after receiving the alarm.

The company was directed to proceed through the employees’ gate and go around behind the castle to the kayak and mutual aid company, located 30 miles from Great Adventure, was on scene at 6:50 p.m.

Additional mutual aid companies were called, bringing a total of 15 fire companies to the incident.

Arriving fire companies encountered some difficulty getting to the fire scene because of civilian congestion. Security directed some of the fire companies to take up positions in areas other than their assigned pre-planned areas.

A mutual aid drill had been conducted on the Haunted Castle a month before the incident. Security personnel were not active participants in that drill.

Great Adventure has its own water supply, maintained by the Jackson Municipal Utilities Authority. There is a one-million-gallon storage tank at a pumped level. This is supplied by two water pumps from artesian wells.

The water demand was not great enough during the initial attack for the pumps to kick in automatically; security had to turn them on.

After the initial attempt to fight this fire in the offensive mode, the strategy changed to an aggressive defensive mode. Not until the fire was knocked down was there an attempt to re-enter the trailers.

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The officer in charge stated that all remains be treated as human, and that nothing be touched.

Firefighting procedures continue throughout the rest of the unit.

The captain firefighter continued to look for signs of other fatalities.

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The team set up and assigned the tasks of collecting information. It was through the use of this information that the point of origin was established.

Upon first investigation, two low turning patterns, remote from one another, tested to appear as two separate points of origin. Further investigation disclosed that the fire had spread from one set of trailers to the other.

The heat and damage that occurred from the burning tires was extensive, and hampered in determining the point of origin.

It was determined that at the end of the stoke room corridor was a crack pad of polyurethane foam. This was to prevent injuries to guests running through the stoke room and hitting the wall. It was also determined that the stoke room light was malfunctioning on the day of the fire.

It would go out for periods of three to four minutes, leaving the corridor in total darkness.

A very common practice in the castle was for the guests to light matches or lighters to see where they were going. The employees were constantly instructing the guests to put out the matches.

On the night of the fire, a 14-year-old was using a lighter to see.

He accidentally walked into the foam on the stoke room wall, setting it on fire.

He attempted to beat it out with a canvas bag, was unsuccessful, and apparently continued through the castle.

When ignited, polyurethane foam burns rapidly. The stove room corridor was constructed of combustible plywood on the ceiling, floor, and walls. The fire spread rapidly down the corridor and around through the phantom and opera sections of the castle.

The course of the fire effectively cut off any avenues of egress for the victims.

Eight teenagers died of smoke inhalation and carbon monoxide poisoning.

The victims were going through the castle in two groups. As the first group of five teenagers went through, they passed the hunchback display and then a display of a revolving barrel. A little further on, as they were nearing the phantom of the opera station, they encountered smoke and hot gases. It was most likely at this point that they started to panic.

Meanwhile, the second group of four teenagers was still advancing and getting nearer the revolving barrel, but when both groups met, all nine teenagers tried to reverse their path and go out the same door, which was now locked.

Victim number one and his girlfriend were the first on scene, but were only able to get as far as the confij display when they were overcome by smoke and fell. The second teenager was able to get to the girl out. The other seven went on to the next corridor by the hunchback display.

The travel distance through the castle was 456 feet. From the entrance to the first emergency exit was 226 feet. At the entrance to the second another 100 feet, and 118 feet to the final exit.

The first victim was discovered approximately 100 feet from the entrance and the remaining seven were found 120 feet into the castle.

...and escape route from the Haunted Castle. The dark panel at the left rear is the polyurethane foam.