



**DANCE HALL FIRE
GOTHENBURG, SWEDEN
OCTOBER 28, 1998**



**FIRE
INVESTIGATIONS**

NATIONAL FIRE PROTECTION ASSOCIATION

Dance Hall Fire

Gothenburg, Sweden
October 28, 1998

Sixty-three Fatalities

Prepared by

Ed Comeau

Robert F. Duval

Senior Fire Investigator
National Fire Protection Association

ABSTRACT

On Thursday evening, October 28, 1998, a fire occurred in a nightclub in Gothenburg, Sweden. A Halloween party was being held in the second floor hall, and officials estimated that there were approximately 400 people in attendance. According to personnel from the fire brigade, one of the survivors reported that there were so many people that it was impossible to even dance because people were crowded shoulder to shoulder. Prior to the fire, the Gothenburg, Mölndal, Kungsbacka Fire Brigade had determined the maximum occupancy should have been 150 people.

The hall where the party was being held measured 32 meters (105 feet) by 9.5 meters (31 feet). There were two exits located at each end of the hall. Each exit was equipped with a door that had an opening approximately 800 mm (31.5 in.) wide. The doors swung outward in the direction of travel and led to stairways that measured 1.5 m (4.9 ft) wide.

The main stairway on the northwest end discharged directly to the exterior. The other stairway on the southeast end discharged into a corridor on the first floor that people would have had to travel through before reaching the exterior. There were several rooms on the northwest end of the hall, in addition to a kitchen. A stage was located on the southeast end where a disc jockey had set up his equipment.

The building was constructed of a combination of concrete and masonry block. The ceiling was comprised of suspended acoustical tile. The composition of the interior finish in the hall itself varied. Approximately 1.2 m (4 ft) of wainscoting was attached to the corridor wall leading into the hall. It was reported that there were decorations hung in the hall for the party and that there were a number of flags on the walls.

There were no automatic fire sprinkler or fire alarm systems in the building. There were lighted exit signs at each end of the hall.

There were a series of windows on the northeast wall. These windows measured 1.8 m by 0.8 m (5.9 ft by 2.6 ft) and the bottom of the windows were 2.2 m (7.2 ft) above the floor. There were a total of eight windows, six of which were in the hall itself. The other two were in the ancillary rooms off of the hall.

On the southwest wall were five similar windows. These windows, however, were equipped with security bars to prevent intrusion.

Shortly before midnight, the disc jockey opened the door leading to the southeast stairwell. Smoke from a fire in the stairwell came into the hall. It is unknown if the door was closed again after the fire was detected. Because of the fire, this stairway

NFPA
Fire Investigations
Department
1 Batterymarch Park
PO Box 9101
Quincy, MA 02269
USA

Phone:
617-984-7263

Fax:
617-984-7110

Email:
investigations@nfpa.org

Web site:
www.nfpa.org

was impassable and was not used during the evacuation.

There were reports that the disco lights on the stage near the door started to pop and then drop to the floor, probably due to the fire exposure.

Using a mobile telephone, the disc jockey called the fire brigade. (It is unknown if he was the first person to contact the fire brigade.) Realizing how crowded the hall was and that he would not be able to make it through the crowd, the disc jockey then broke out a window in the northeast wall and jumped out of the building.

The dispatcher who received the call reporting the fire had some difficulty ascertaining the address of the fire because of the background noise. The dispatcher was eventually able to do so, and an initial response of an engine and a ladder with a total of eight fire fighters was dispatched.

The first fire brigade units arrived on the scene from a fire station located 2.2 km (1.4 mi) away. As they approached the complex from the far side, an officer reported light smoke visible and thought that it might be a container fire. As they turned the corner, they were able to see the building on fire and the officer realized that it was a major fire. He requested the dispatch of additional units, but the units had already been dispatched, based on additional telephone calls being received by the alarm room.

There were a large number of people blocking the fire apparatus access to the scene. The officer had to walk in front of the apparatus to get people to clear the way and allow the fire fighters to approach the building.

As the officer approached the building, he observed a number of injured people lying on the ground who had jumped from the second story windows. Because of the injured people lying on the ground below the windows, fire fighters were unable to place ground ladders up to the windows on the northeast side of the building.

The officer and his fire fighters then attempted to enter the building through the main entrance at the northwest end. It was reported that the stairway was blocked with a tangle of injured people. These people had to be dragged outside before the fire fighters were able to proceed up the stairs.

When they reached the top of the stairs, they were faced with a wall of bodies inside of the door to the hall. It was reported that the bodies were packed in tight, from the floor to the top of the doorway. The fire fighters started removing the bodies and quickly passing them down the stairs to the exterior of the building. As they removed the bodies from the pile in the doorway, others from inside the burning hall attempted to climb out through the openings that had just been created.

While this rescue operation was being conducted, the aerial apparatus placed a ladder on the northeast side to one of the windows. Water from a hand line was discharged

into the building from the ladder in an effort to protect the occupants and to reduce the severity of the fire. A fire fighter in breathing apparatus entered the building through one of the windows, dropping 2.2 m (7.2 ft) to the floor. He immediately requested via radio that a short ladder be passed to him so that victims could be rescued from inside the building. One was placed inside the building and one female was rescued in this manner.

The fire fighter then continued to advance into the building. It was reported that people were pulling at him as he made his way in and that his breathing apparatus facepiece was almost pulled from his face. He stated that the interior was dark, smoky, and hot, but that there was not any heavy fire involvement at this time. As he progressed further in, he started to see some light from the doorway at the northwest end. This occurred because the fire fighters working in the stairway were now removing the bodies that had been obstructing the doorway.

Once the fire was extinguished, about 20 bodies were found in a small room on the northwest end of the building. It appeared that these victims were attempting to flee the fire and were not able to make it through the door at the northwest end. They then attempted to take refuge in the room, but were overcome by smoke. One fire officer reported that the bodies were piled approximately 1 m (3 ft) deep in this room.

A total of 63 people died in this fire, mostly from smoke inhalation. Their ages ranged from 14-to 20-years-old. One hundred eighty people were injured. The fire brigade estimated that they rescued 50 to 60 people.

The cause of the fire has been determined to be incendiary in nature. At the time of this writing, arrests had been made in the case.

Based on NFPA's investigation and analysis of this fire, the following significant factors were considered as having contributed to the loss of life and property in this incident:

- Overcrowding,
- Lack of a fire alarm system,
- Ignition of combustible storage in a stairwell

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I. INTRODUCTION

The National Fire Protection Association (NFPA) investigated the Gothenburg dance hall fire in order to document and analyze significant factors that resulted in the loss of life and property.

The investigation was conducted by NFPA as part of its ongoing program to investigate technically significant incidents. NFPA's Fire Investigation Department documents and analyzes incident details so that it can report lessons learned for life safety and property loss prevention purposes.

NFPA became aware of the fire on the day it occurred, and Ed Comeau, former chief fire investigator of NFPA's Fire Investigations Department, traveled to Gothenburg, Sweden, to perform an on-site study of this incident. That four-day, on-site study, documentation, and subsequent analysis of the event are the basis for this report. Entry to the fire scene and data collection activities were made possible through the cooperation of the Gothenburg Fire Brigade.

This report is another of NFPA's studies of fires having particular important educational or technical interest. All information and details regarding fire safety conditions are based on the best available data and observations made during the on-site data collection phase and on any additional information provided during the report development process. It is not NFPA's intention that this report pass judgment on, or fix liability for, the loss of life or property resulting from the fire. Rather, NFPA intends that its report present the findings of the data collection and analysis effort and highlight factors that contributed to the loss of life or property.

Current codes and standards were used as criteria for this analysis so that conditions at the dance hall on the day of the fire could be compared with state-of-the-art fire protection practices. It is recognized, however, that these codes and standards may not have been in effect during construction or operation of the building. NFPA has not analyzed the building regarding its compliance with the codes and standards that were in existence when the structure was built or during its operation.

The cooperation and assistance of the Gothenburg Fire Brigade is greatly appreciated.

The efforts of former NFPA Chief Fire Investigator Ed Comeau in the preparation of this report are also greatly appreciated.

II. BACKGROUND

Occupancy Classification

According to NFPA 101[®], *Life Safety Code*[®], 1997 edition, the occupancy would have been classified as an Existing Assembly Occupancy.

The Building

The building had been constructed in the 1930's. The area where the fire occurred had been converted to a hall in 1990. In 1990 a series of violations had been noted by the Gothenburg Fire Brigade. These violations were corrected, and the building was allowed to reopen.

The building was comprised of a number of different occupancies that varied in size, height, and occupancy types. The remainder of this report will focus on the section of the building that contained the nightclub.

The building was constructed of non-combustible material, and the bearing walls were comprised of concrete block.

The pitched roof and the floor assembly were constructed of concrete. The ceiling was comprised of suspended ceiling tiles. The void space above the ceiling measured approximately 1 m at the ridgeline.

The entire nightclub measured 35.4 m by 9.5 m (116 ft by 31 ft) for a total area of 336.3 m² (3,596 ft²). Within this, the main hall that was used for dancing measured 22.6 m by 9.5 m (74 ft by 31 ft). There was a folding dividing wall that, when closed, would create two areas within the large hall. According to local officials, this wall was in the open position at the time of the fire.

A kitchen area was located in the southwest corner of the hall. There were a number of rooms located at the northwest end of the hall. (See Figure No. 1)

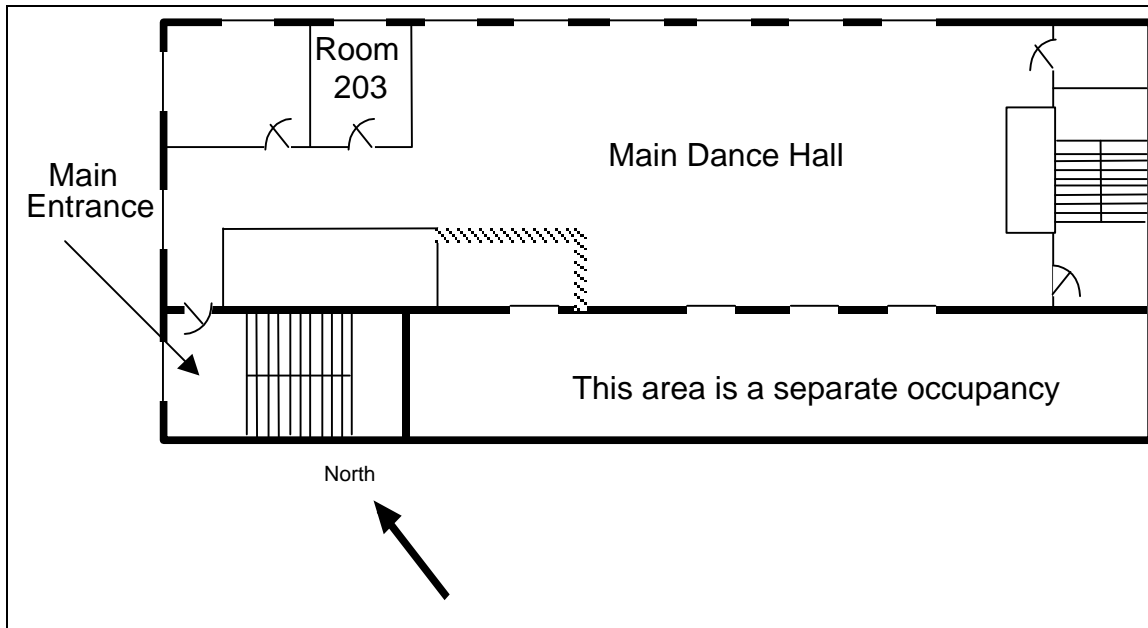


Figure No. 1 – Site Plan

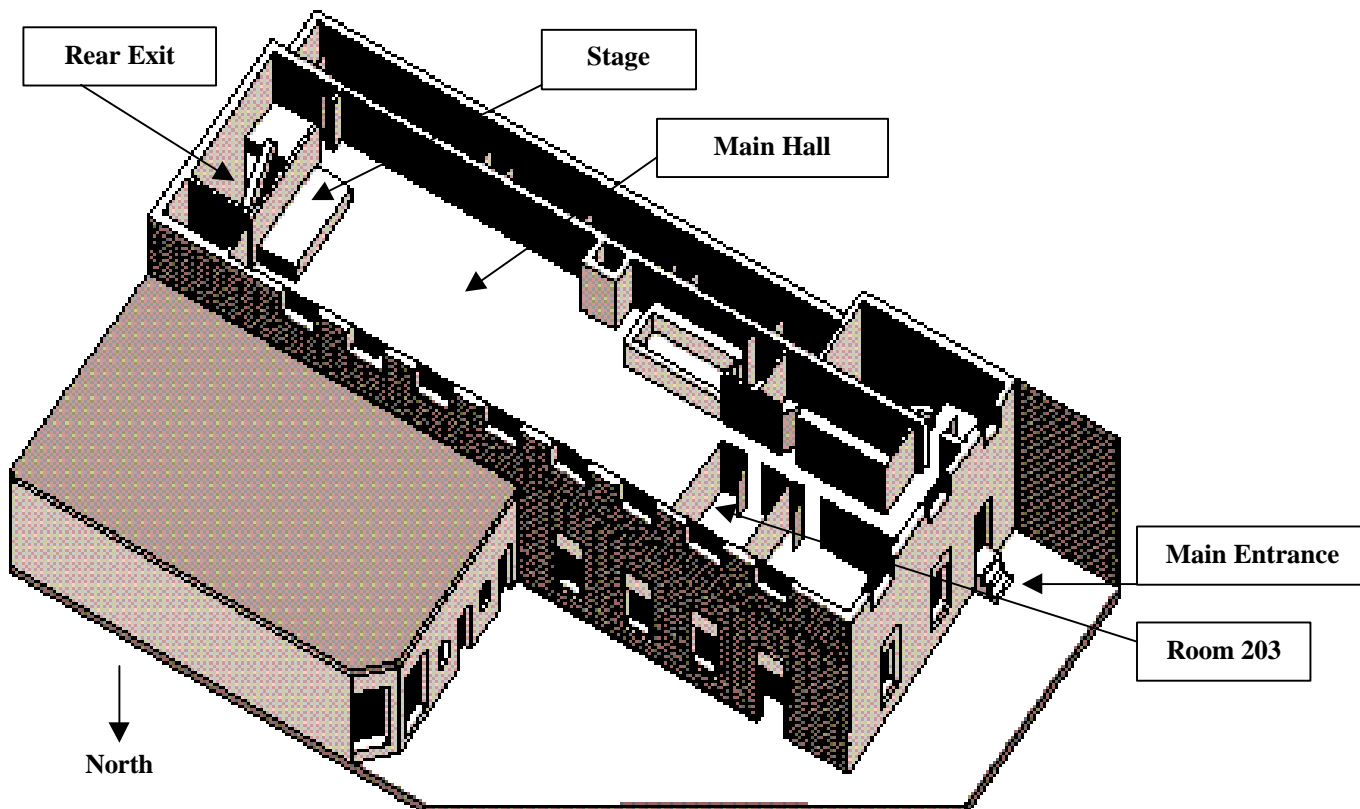
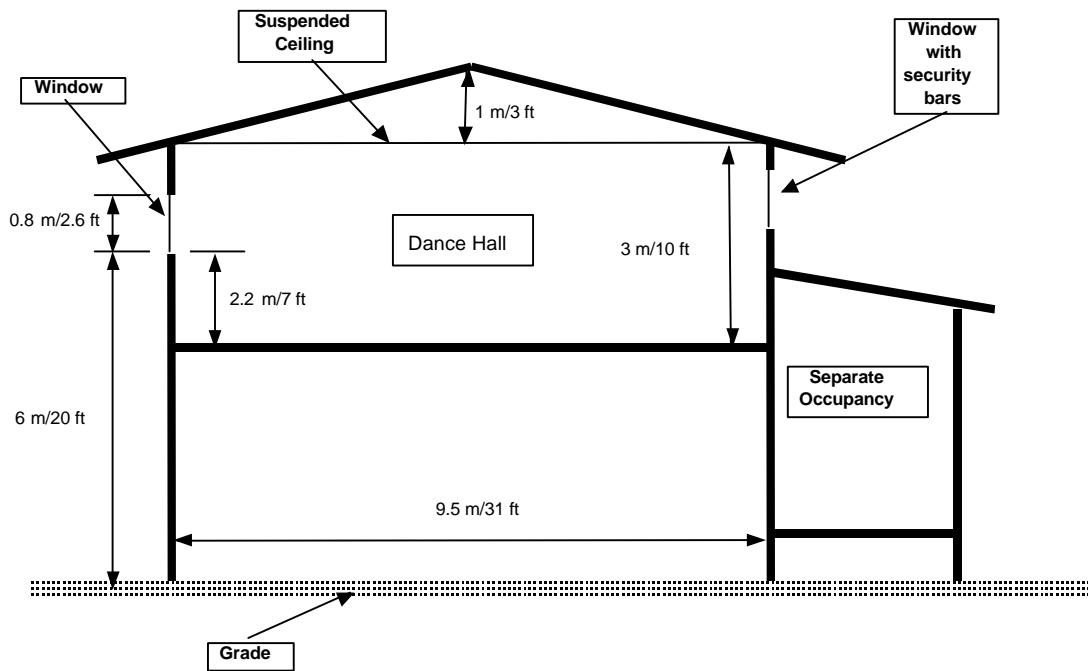


Figure No. 2 – Detailed Site Plan

One room, referred to on the plans as room #203, measured 3.4 m by 4 m (11 ft by 13 ft). Another room, referred to as room #202, measured 5.2 m by 4 m (17 ft by 13 ft). Both of these rooms were equipped with hollow-core doors that swung into the rooms. Room #203 had one exterior window on the northeast wall, and room #202 had two exterior walls, one on the northeast wall and one on the northwest wall. (See Figure 2)

The interior walls for these rooms were comprised of wood studs covered with gypsum board on each side. The walls extended upward for a height of approximately 3 m. The remainder of the wall, from the top of the wood stud/gypsum wallboard assembly to the underside of the suspended ceiling was comprised of glass panels. (See Figure 3)



Cross Section A-A (see Figure 5)

NOTE: Original measurements shown were in meters. Conversions were rounded to the nearest foot.

All doors are 0.8 m/2.6 feet

Windows measure 1.8 m by 0.8 m (6 ft x 2.6 ft)

Figure No. 3 – Building Cross Section

On the northeast exterior wall of the hall were eight windows. These measured 1.8 m by 0.8 m (6 ft by 2.6 ft) and were located 2.2 m (7.2 ft) above the floor. From the exterior, three of these windows were 6 m (20 ft) above grade. Five of the windows were located over the roof of an attached one-story portion of the complex.

On the southwest side were five exterior windows. These windows were similar to the ones on the northeast side except that they were equipped with security bars to prevent intrusion.

A stage was located at the southeast end of the hall. A disc jockey had his equipment set up on this stage. The exact size and construction of this stage is unknown.

A combination kitchen/serving area was located along the southwest wall towards the northwest end of the dance hall.

The total net area of the second floor that made up the main assembly area, when deducting the ancillary rooms, closets, kitchen and serving area was 237 m² (2,551 ft²). (See Figure 4)

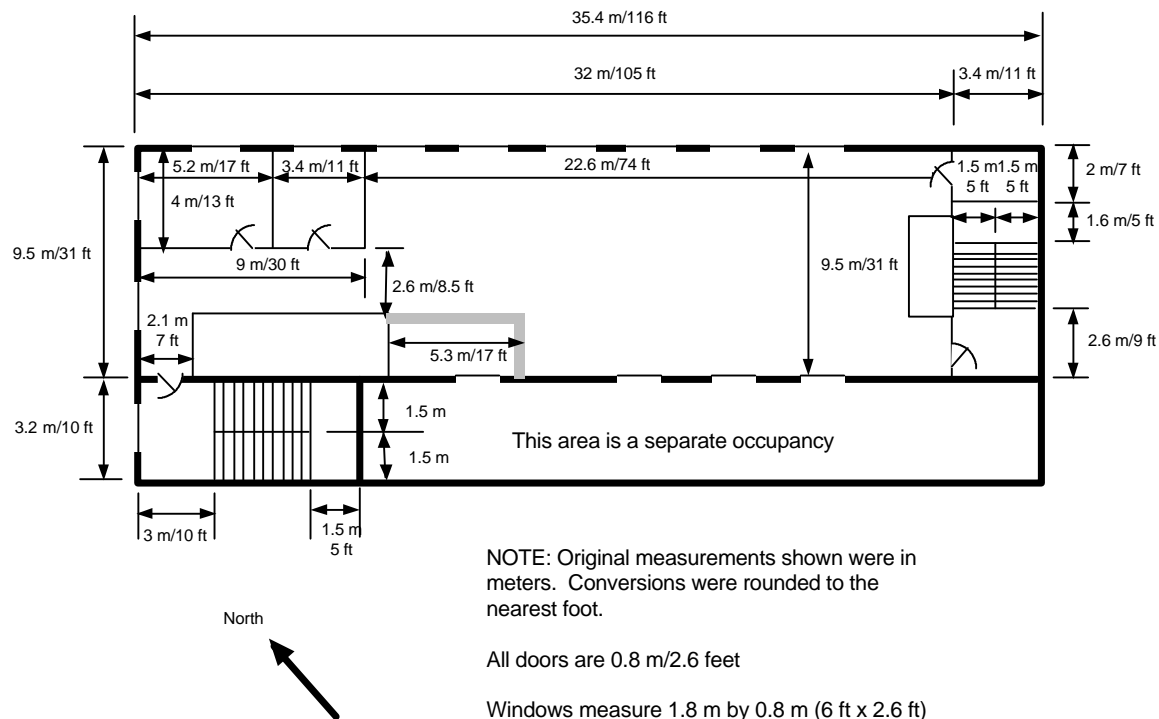


Figure No. 4 – Floor Plan of Building

Interior Finish and Furnishings

It was reported that there were decorations hanging in the nightclub, as well as flags on the walls. The exact quantity of these items is unknown.

The interior wall finish was non-combustible plaster finish and possibly combustible wood paneling.

The tables and chairs in the main hall were a combination of combustible material on non-combustible (metal) frames. The exact composition and material is unknown.

Fire Protection Systems

The building was not equipped with an automatic fire alarm or fire sprinkler system. There was an occupant-use hose cabinet in the northwest (main) entrance on the second floor of the building. (It is unknown if this was a wet or dry system.) (See Photo 1)



Photo No. 1 – An occupant-use hose cabinet was located in the entrance corridor adjacent to the exit stairway. (NFPA)

Means of Egress

There were two means of egress located at opposite ends of the hall. The door on the northwest end had a 0.8 m (31.2 in.) wide, non-combustible, rated door that swung in the direction of egress travel. This door was equipped with an automatic closer. It led directly to a stairwell that measured 1.5 m (58.8 in.) wide. The treads measured 200 mm (7.9 in.) and the riser measured 200 mm (7.9 in.). This stairway led directly to the exterior of the building. To reach this door, the occupants from the main hall would have to pass through a 2.6 m (8.5 ft) wide, 9 m (30 ft) long corridor, turn left 90 degrees and pass through a 2.1 m (6.9 ft) wide, 2.4 m (7.9 ft) long corridor. (See Photo 2 and Photo 3)



Photo No. 2 – View from the main entrance, leading into the hall. To enter the hall, the occupants would turn right, just beyond the flag on the wall. (NFPA)



Photo No. 3 - The view towards the main entrance/exit. The dance hall is to the photographer's left in this view. (NFPA)

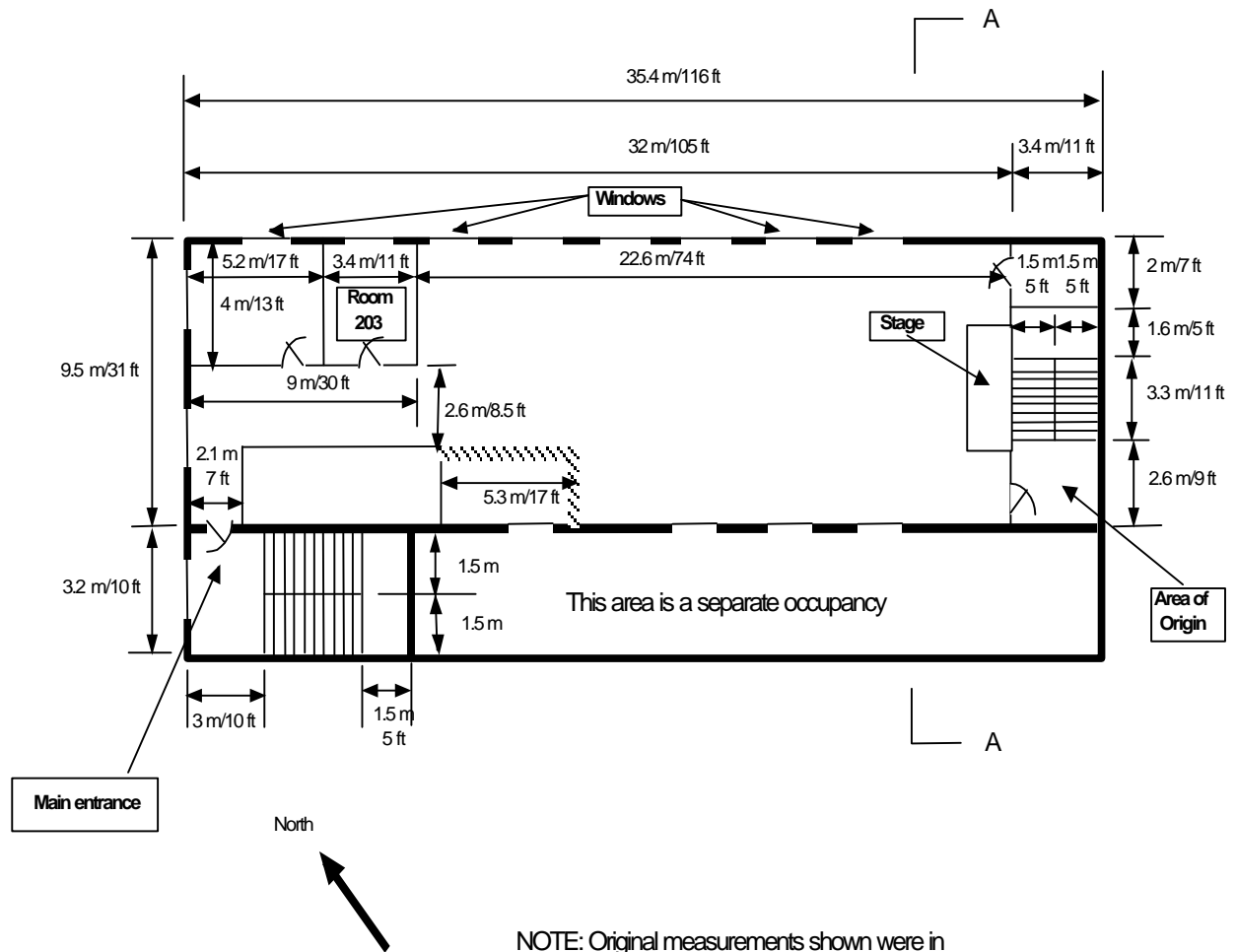
The other means of egress was located in the southeast end of the hall. This entrance was also equipped with a 0.8 m (31.5 in.) wide door that swung in the direction of egress travel. This door was constructed of combustible material, but had a 30-minute fire protection rating and was equipped with an automatic door closer. This door led to a 1.5 m (59 in.) wide stairway that led downstairs to the first floor. The remains of furniture were found in this stairway. One of the survivors reported to investigators that some of the furniture in the hall had been placed in the stairway to make more room. (See Photo 4)



Photo No. 4 – The door at the bottom of the southeast exit from the hall discharged into a common corridor area. (NFPA)

Once they were on the first floor, occupants would have then been required to traverse a path that measured approximately 100 m (328 ft) before reaching a door that discharged to the exterior. According to personnel from the fire brigade, this corridor had a one-hour fire rating. This corridor eventually widened sufficiently so that vehicles could enter it to make deliveries and pickups. (See Photo 5 and Figure 5)

It was reported that there were illuminated exit signs at each exit.



NOTE: Original measurements shown were in meters. Conversions were rounded to the nearest foot.

All doors are 0.8 m/2.6 feet

Windows measure 1.8 m by 0.8 m (6 ft x 2.6 ft)

Figure No. 5 – Detailed Floor Plan



Photo No. 5 – Occupants would have to traverse this corridor to ultimately reach an exit. (NFPA)

Building Occupants

A Halloween party was being held for high school students. At the time of the fire it was estimated that there were more than 400 occupants in the dance hall. Based on the fact that 63 people died and 180 were injured, there were at least 243 people within the building. The area was permitted for an occupant load of 150 people by the Gothenburg Fire Brigade.

Weather

The weather was reported to be about 2°C (35.6° F), overcast with drizzle.

Fire Brigade

The Gothenburg, Mölndal, Kungälv Fire Brigade has 18 stations located throughout the area. There are a total of 123 members on duty per shift.

Each engine is staffed by five fire fighters, and each ladder is staffed by three fire fighters. In addition, several of the stations have an ambulance that is staffed by two medical personnel. An additional ambulance in the station can be staffed by the fire fighters if needed.

Gothenburg has automatic aid agreements with two other bordering cities – Mölndal and Kungälv.

The Gothenburg, Mölndal, Kungälv Fire Brigade provides protection to a community of 650,000 citizens over 1,471 square kilometers (566 sq mi). In 1997 they responded to 6,000 calls.

III. THE FIRE

Discovery and Occupant Activities

The hall had been rented for a Halloween party for high school students. Normally, if a function is to be held where admission is charged, it is necessary to obtain a permit from the fire department. This permit would contain the allowable occupant load. In this case, no permit was obtained from the fire department, and witnesses reported that tickets had been sold for the event.

Occupants entered the hall through an exterior door located at the northwest end of the building and then went up one flight of stairs. According to witnesses, it was very crowded inside of the dance hall. One woman reported that there were so many people that it was impossible to dance.

Sometime before midnight, the disc jockey opened the door to the southeast stairway. (It is unclear if he opened it because he observed smoke coming from the doorway.) When he opened it, he reported seeing a fire in the stairway and smoke started to enter the hall. It is unknown whether he closed the door after detecting the fire.

The disc jockey then used his mobile telephone to call the fire brigade and report the fire. (It is unclear if he was the first person to notify the fire brigade.) He realized that he would not be able to get out of the building through the northwest exit, so he broke out a window on the northeast wall and jumped down to the roof of the adjacent building. It appears that he did not make any announcement to the occupants regarding the fire.

Occupants of the hall became aware of the fire and attempted to evacuate from the northwest exit. Some survivors reported that they first became aware of the fire when lights around the stage started to pop. Others who were further away from the stage reported observing smoke, but at first they thought that it was from cigarette smoke.

Because of the congestion being caused by the number of people attempting to flee the fire through this one door, others broke out the windows on the northeast wall and jumped to the ground from a height of 6 m (20 ft). These windows were 2.2 m (7.2 ft) above the floor, so it must have been difficult for the occupants to use these windows as a means of escape from the building. (See Photo 6 and Photo 7)



Photo No. 6 – Interior view of window that occupants broke out and jumped from on second level of building. (NFPA)



Photo No. 7 – Exterior view of building showing the windows that had been broken out on the second floor and where occupants jumped to the ground. (NFPA)

There was a folding wall that extended across the hall. According to local officials, it was in an open position at the time of the fire and, therefore, would not have served as any type of barrier to movement.

Fire Department Notification and Response

A person using a cell phone made a call to the fire brigade. Because of the excitement in the person's voice and the background noise, the fire dispatcher had difficulty ascertaining what the exact address was. Once the location was determined, an engine and a ladder were dispatched, staffed by 6 fire fighters and 2 officers.

The first units were dispatched from Lundby fire station that was 2.2 km (1.4 mi) from the fire. Their route of approach was from the west side of the complex, and the fire building was not immediately visible as they approached. The first arriving officer reported that he could see some light smoke, and initially thought it might be a container (dumpster) fire. The driver also stated that it was "not the typical black smoke we normally see at building fires."

As they turned the corner, the fire became visible, and the officer called for additional units to respond. (Because of the additional telephone calls regarding the fire, these units had already been dispatched.) A large crowd was filling the parking lot outside of the building blocking the apparatus, and the officer had to walk in front of the engine to get the crowd to move aside so they could approach the building.

The officer observed a number of injured people lying on the ground who had jumped from the windows 6 m (20 ft) above. There were people in the windows on the second floor with a fully developed fire behind them. These people were being pushed out of the windows by those behind them, dropping 6 m (20 ft) onto the ground. The officer requested additional units, but they had already been dispatched based on additional telephone calls being received by the alarm room.

Personnel from the engine attempted to make entry through the main door on the northwest end of the building. As they entered the stairway, the bodies of victims lying on the stairs blocked their way. These victims had to be dragged outside before the fire fighters could make their way up the stairs. At the same time, civilians were trying to enter the building through this stairway to attempt to rescue people trapped in the fire.

At the top of the stairs was the door that led into the hall. The fire fighters reported that their access was blocked by a wall of bodies inside of the doorway that reached the top of the doorjamb. They began pulling these victims out and dragging them down the stairs to the exterior of the building. However, as they were removing bodies, others from inside the burning hall moved forward and filled in the spaces where victims had been removed.

While this operation was being conducted, an aerial ladder was raised to the windows on the northeast side. Water was discharged into the building in an effort to reduce the severity of the fire and to attempt to protect the people inside of the building. A fire fighter then entered the building through the window, dropping 2.2 meters (7.2 ft) to the floor. Via radio, he immediately requested a short ladder to use inside of the building in rescuing victims through the window. One was passed to him, and he was able to get one 20-year-old female out through the window.

He continued into the building and reported that victims were pulling on his clothing and equipment as he entered. At one point his breathing apparatus mask was almost pulled from his face. Initially it was very dark, smoky, and hot inside of the hall. However, he reported no major fire involvement at this time. He continued in, and then began to see a glow of light from the stairway at the northwest end. This occurred as the rescuers in the stairway began to remove the bodies piled in the door and light from the stairway began to enter the hall.

Eventually fire fighters were able to advance a hoseline through the main door and suppress the fire.

The senior command officer responded and assumed command when he arrived. His command post was established in the street to the northeast of the building. He reported that the primary efforts of the fire personnel were on rescue and not on fire suppression.

According to the incident commander, the crowd was hindering the fire fighters' operations. Civilians were attempting to enter the building through the northwest entrance where fire fighters were attempting to make rescues. A civilian struck a fire fighter on the helmet with a bottle (the fire fighter was not injured.) Another fire fighter was assaulted as he was trying to render aid to injured victims. Police officers were required to restrain and control the crowd to allow fire personnel to operate.

An automotive repair garage adjacent to the building was forced open and used as a triage area for the injured. A liaison with the four local hospitals coordinated the transportation of the injured based on the severity of their injuries. A doctor who was on her way home stopped to assist. (See Photo 8)



Photo No. 8 – This adjacent garage was forced open and used as a triage center for the injured victims. (NFPA)

All fifteen ambulances from the fire brigade were used to transport the victims. To facilitate the traffic flow of ambulances picking up victims at the garage, two sections of fencing were cut down to create a vehicle entrance and exit. Forty-five patients were transported by ambulances to the hospitals over a period of two hours.

Because of the number of injured people, in some cases 6 or 7 patients were transported in one ambulance with a single ambulance orderly. These people would take turns breathing through a single oxygen mask while enroute to the hospital.

Three municipal buses were requested and used to transport people with lower priority injuries to the hospitals. Taxi cab drivers volunteered to drive those with lesser injuries and their friends to the hospitals. Approximately 100 patients were transported to four hospitals.

The fire brigade rescued approximately 50-60 people.

Because of the magnitude of the incident, the incident commander ordered the city emergency operations center at the fire brigade headquarters to be activated.

Once the fire was suppressed, 20 additional victims were found in a small room at the northwest end of the hall (room #203). It is theorized that these people were attempting to flee the fire through the main exit when their way was blocked by the

large number of people attempting to pass through the one door. They then attempted to take refuge in the room, but were overcome by smoke. The command officer reported that there were victims piled three to four feet deep in this room. (See Photo 9)



Photo No. 9 – In Room 203 a number of victims had attempted to take refuge from the smoke and flames. (NFPA)

A temporary holding area for the bodies was set up on the southwest side of the complex, away from the crowd. The priority was to remove the bodies from the scene before sunrise. After all of the injured people had been transported to the hospital, nine ambulances were used to transport the bodies to the Sahlgrenska Hospital where they had the facilities to accommodate a large number of fatalities.

Casualties

Sixty-three people died in the fire. One hundred eighty people were injured. The people who were killed and injured represented 19 different nationalities.

Forty-three people were found, piled up in the main entrance on the northwest end. An additional 20 bodies were found in Room 203 where they had apparently taken refuge to escape the fire.

The ages of the fatalities ranged from 14 to 20. Thirty-three males and twenty-nine females were killed (the sex of one of the fatalities is unknown).

Damage

The main hall area was severely damaged by the fire. The ceiling assembly was also destroyed. Seven of the eight exterior windows on the northeast side were totally destroyed. All five windows on the southwest side were also destroyed. (See Photo 10)



Photo No. 10 – This is a view of the interior of the main hall from the entrance looking towards the stage. (Note: None of the contents had been removed from the area when this photo was taken.)

The fire did not damage a storage room on the east corner, where the door was closed.

Room #203 on the northwest end of the hall had heavy smoke damage. This is the room where a large number of people attempted to flee the fire and were overcome by smoke. The condition of the door to this room was unknown. However, the glass panels at the top of the wall to this room were totally destroyed by fire. The next room moving further towards the northwest room, room #202, received smoke damage from the fire. Reportedly this door was closed and locked during the incident, so no one was able to gain access to this room. (See Photo 11)



Photo No. 11 – This is the wall that separated Room #203 from the main hall. At the top of the wall were glass panels that failed during the fire, allowing smoke to spread into this room.

The exit stairwell on the northwest end was not damaged and did not have any smoke damage from the fire.

The concrete roof assembly remained intact and was not breached during the fire.

IV. TIME LINE

<u>Time</u>	<u>Elapsed Time</u> [hh:mm]	<u>Event</u>
23.42	00:00	Fire alert came from the alarm monitoring company.
23.45	00:03	An assignment from the Lundby station was dispatched. This included 1 station officer, 1 leading fire fighter and 6 fire fighters with pumping appliance and a turntable ladder.
23.46	00:04	B 471 and B473 (pumping appliance and turntable ladder) acknowledged by radio that they were responding and verified the address.
23.47	00:05	The police's Direction Central was informed.
23.47	00:05	Ambulance 873 and Emergency Ambulance 878 were dispatched. During this time, the alarm room received more reports and decided to dispatch additional units.
23.49	00:07	An assignment from the Garda station was dispatched to assist the units responding from Lundby. This included 1 station officer, 1 leading fire fighter, and 6 fire fighters with pumping appliance and turntable ladder.
23.49	00:07	When the officer from Lundby requested additional units to respond he was informed that Garda station was alerted.
23.49	00:07	Ambulance 873's acknowledgment over the radio.
23.49	00:07	Lundby Station units arrived on the scene. The officer reported that people were jumping out of windows and demanded more units.
23.50	00:08	Ambulance 878's acknowledgment over radio.
23.50	00:08	Lundby Station hydraulic platform B 478's acknowledgment over radio.

23.50	00:08	Garda Station 1-1-6 acknowledgment of alert over radio, and address check.
23.51	00:09	Called on Garda Station “Remaining forces with hydraulic platforms and fans to the fire ground.”
23.51-23.54	00:09-00:12	Alarm room alerted ambulances O 823, O853, and O 813.
23.54	00:12	O 823 arrived on the scene.
23.55	00:13	Garda Station on the scene.
23.56	00:14	Ambulance O 824 was reported to be available and on its way to the fireground.
23.57	00:15	The Station Officer on Duty with O 402 (control unit) on his way to the fireground.
23.58	00:16	Tank truck and fans on their way from Garda Station to the fireground.
23.59	00:17	Kortedala Station tank truck with two fire fighters going to the fireground.
23.59	00:17	O 428 Garda Station hydraulic platform on scene.
00.00	00:18	Ambulance O 828 on its way to the fireground.
00.00	00:18	O 853 on the scene.
00.01	00:19	O 813 on the scene.
00.00-00.05	00:18-00:23	RIB notified (First Commander of Rescue Services). Callback of staff for yellow-red alert continued.

Additional ambulance resources drawn from:
Möln dal – 4 ambulances
Kungälv – 2 ambulances
Stenungsund – 1 ambulance
Medical teams from Östra Hospital and Sahlgrenska Hospital were alerted.
Östra, Sahlgrenska, and Möln dal Hospitals were notified.

00.11	00:29	Angrered Station dispatched. 1 station officer, 2 leading fire fighters and 5 fire fighters with pumping appliance and turntable ladder.
00.13	00:31	Angrered Station's acknowledgment over radio.
00.16	00:34	Mölndal dispatched a breathing apparatus van to the fire ground, acknowledgment over radio.
00.20	00:38	Apparatus were moved up to fill empty stations.
00.21	00:39	Angrered Station on the fire ground.
00.24	00:42	O 967 on its way with a medical team from Östra.
00.27	00:45	Mölndal Station with 1 station officer, 1 leading fire man and 3 fire men were dispatched with stretchers and blankets to the fireground (alerted after a telephone contact).
00.31	00:49	RIB on the fireground (on-duty chief officer).
00.37	00:55	MI Station on the fireground.
00.40	00:58	Buses were demanded from Göteborgs region traffic as heating places and for transportation of those less critically wounded.
00.50 (approx.)	01:08	One of the station officers reported via telephone from the scene that most of the wounded were out of the building, they had formed a good structure for the caring and transportation, and he estimated the number of deceased to about 50-70. He also said they were now focusing more on putting out the fire.
01.20	01:38	Öjersjö Fire Station with 1 station officer, 1 leading firefighter and 3 firefighter staffing a pumping appliance were called to the fire ground.
01.50	02:23	Kungälv Fire Station with 1 leading firefighter and 4 firefighters staffing a pumping appliance were called to the fire ground.

01.54	02:27	Report from the disaster area: All wounded were brought to the hospital.
02.02	02:35	Report from the disaster area: The fire was out, the firefighters had started to carry out the deceased.

V. ANALYSIS

Cause and Origin

The cause of the fire has been determined to be incendiary in nature. It originated in the stairway on the southeast end of the building and spread into the hall through the door at the top of the stairway. As of this writing, arrests have been made in the case.

Fire Growth and Spread

The fire was fueled by the presence of combustible furniture stored in the stairway. Once the fire spread into the hall from the stairway, it ignited the combustible furnishings and decorations. It then spread to the northwest throughout the hall. There were reports of combustible decorations hanging from the ceiling and on the walls that would have also fueled the fire. The type and quantity of these decorations is unknown. The interior finish in the hall was possibly comprised of combustible wood paneling, which provided an additional fuel load. (See Photo 12)



Photo No. 12 – The furnishings in the Main hall comprised mainly of combustible materials over metal frames.

VI. DISCUSSION

The following were significant contributing factors to the loss of life in this incident:

- Overcrowding that exceeded the means of egress capacity
- Lack of a fire alarm system
- Ignition of combustible fuel load in a stairway

This assembly met the basic requirement of exit design in that it had two remotely located means of egress. The exit stairway on the northwest end discharged directly to the exterior. Because the second exit discharged into a non-fire rated corridor on ground level, it would not have been a compliant means of egress for this facility.

The limiting factor in determining the occupancy load for this occupancy would have been the width of the doors. According to NFPA 101[®] *Life Safety Code*[®], 365 people would have been permitted within this occupancy, using calculations based on area. However, based on the width of the doors within the means of egress, only 312 people would have been allowed.

Based on the number of people killed and injured, there were a minimum of 243 people in the hall. However, some estimates have placed as many as 400 people in the building at the time of the fire. According to the Gothenburg Fire Brigade, they would have permitted only 150 people within this occupancy based on the width of the doors.

Even though there were two remotely located means of egress, constructed of non-combustible materials, and all of the doors swung in the direction of travel, the occupant load exceeded the capacity of these means of egress to handle the number of people that were possibly inside. The means of egress are remotely located to minimize the probability that a single fire will block more than one means of egress.

However, when the number of occupants greatly exceeds this capacity, the exit design cannot handle the large number of occupants attempting to flee a fire. The results, as we have seen, can be tragic. Even though this was determined to be an arson fire that obstructed one of the exits, the occupants should still have been able to safely evacuate the building if the number of occupants had been within the calculated capacity.

The exact number of occupants in the building will probably never be known, but this appears to have been a major factor in the death toll. The main exit became congested and impassable very quickly, causing people to seek other means to escape. According to reports, people were standing shoulder-to-shoulder and unable to dance, thus it is possible that the occupant load had reached what is referred to as “jam point” or grid-lock. This is the point where movement by the occupants comes

to a virtual stop. There are so many people that individuals are not able to move on their own volition to escape, but are dependent upon the people in front of them to move first.

The windows were not a viable exit. They were located 2.2 m (7.2 ft) above the floor and were not easily accessible for the occupants. Furthermore, the security bars on the windows on the southwest side would have prevented any escape from the building.

According to NFPA 101[®] *Life Safety Code*[®] and based on the occupancy classification, a fire alarm system equipped with manual pull stations and audible and visual alerting devices would have been required. Once activated, such alarms would be required to sound in a constantly attended location within the building. Once notification is made to such a location, appropriate actions should be taken to in the form of a voice announcement, either live or prerecorded, to notify the occupants of the fire and to begin evacuation of the building.

Placing the furniture in the stairway created two problems. First, it obstructed a required exit. Second, it provided a fuel load that was deliberately ignited, thereby rendering this means of egress unusable in any case. This fire vividly demonstrates the tragic consequences of not following basic fire safety requirements and ensuring that all means of egress are kept free and clear at all times.

It is unclear how much a delay in notifying the occupants of the fire, once it was ignited and then detected, played in the outcome. Certainly, if the occupants had been provided with earlier warning, they could have started evacuating sooner. However, because of the number of people within the dance hall, the same problem may have still arisen in terms of getting everyone out successfully.

VII. CONCLUSION

History has painted a tragic picture of fires occurring in places of assembly. They have been the scenes of seven of the 11 deadliest single-building fires in U.S. history, according to *NFPA Fire Protection Handbook*, 18th edition. These incidents include:

• Brooklyn Theater Fire	1876	285
• Iroquois Theater Fire	1903	602
• Rhoades Opera House Fire	1908	170
• Louisiana Restaurant Fire	1919	25
• Dance Hall	1928	38
• Night Club	1929	22
• Rhythm Club	1940	207
• Cocoanut Grove	1942	492
• Ringling Brothers/Barnum and Bailey Circus	1944	168
• Beverly Hills Supper Club	1977	165
• Happy Land Social Club	1990	87

Unfortunately, the fire in Gothenburg, where 63 young people lost their lives, will now be added to a growing list of multiple fatality fires in assembly occupancies.

As this report was being prepared, another fire occurred on October 31, 1999, in Inchon, South Korea that killed 55 young people and injured 78. This fire, which was exactly one year after the Gothenburg fire, broke out in the basement level of a four-story building that had an illegal bar on the second floor.

VIII. NFPA DOCUMENTS

<p>NFPA 101[®] – Code for Safety of Life from Fire in Buildings and Structures (<i>Life Safety Code</i>[®])</p>	<p>This Code addresses life safety from fire. Its provisions will also aid life safety in similar emergencies.</p> <p>The Code addresses those construction, protection, and occupancy features necessary to minimize danger to life from fire, including smoke, fumes, or panic.</p> <p>The Code identifies the minimum criteria for the design of egress facilities so as to permit prompt escape of occupants from buildings or, where desirable, into safe areas within buildings.</p> <p>The Code recognizes that life safety is more than a matter of egress and, accordingly, deals with other considerations that are essential to life safety.</p> <p>The Code does not attempt to address all those general fire prevention or building construction features that are normally a function of fire prevention and building codes.</p>
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IX. APPENDIX – Fatal Fires in Places of Assembly

Beverly Hills Supper Club Southgate, Kentucky May 28, 1977

On Saturday, May 28, 1977, a disastrous fire occurred at the Beverly Hills Supper Club in Southgate, Kentucky claiming the lives of 164 patrons and employees, and injuring some 70 others. This fire was the worst multiple-death building fire in the United States since the Coconut Grove night club burned in Boston, Massachusetts on November 28, 1942, taking 492 lives.

The Beverly Hills Supper Club, classified as a place of assembly, was a sprawling mostly one-story restaurant and night club that was over one acre on area. A small part of the building was two-story and there was a basement under approximately half of the complex. The original two-story portion was constructed in 1937 and additions were added at various times with a major rebuilding of the club following a fire in 1970.

The building was basically comprised of unprotected, noncombustible type construction and did not have automatic sprinkler protection or a fire detection and alarm system.

The crowd in the Club was estimated at 2,400 – 2,800 people on the night of the fire, with approximately 1,200 – 1,300 people attending a show in the Cabaret Room, a large showroom that featured well-know entertainers.

A fire originating in a small, unoccupied function room on the opposite end of the Club, burned for a considerable time before discovery. The probable cause was determined to be electrical in nature with the ignition of combustible material in a concealed space. When the fire was discovered the Club staff unsuccessfully attempted to fight the fire before notifying the fire department or alerting occupants in the building to evacuate. Most of the patrons were evacuated with the assistance of employees. However, when the Cabaret Room occupants were made aware of the fire, they did not have adequate time nor was there sufficient egress capacity provided for those occupants to escape. Many were overcome by fire gases and smoke. One hundred and sixty-four occupants of the Beverly Hills Supper Club died, nearly all were occupants of the Cabaret Room.

Following the fire an examination and analysis of the facts revealed many facility and operational deviations from the national consensus fire codes and standards particularly NFPA 101[®] *Life Safety Code*[®].

The major contributing factors to the large loss of life in this fire include:

- The fire in the Zebra Room developed for a considerable amount of time and discovery was delayed. The presence of concealed, combustible ceiling tile and wood materials used for supports provided a fuel supply for continued spread of the fire through the original and other concealed spaces. Following discovery, this fire posed a severe threat to occupants.
- The Beverly Hills Supper Club staff attempted to extinguish the fire before notifying occupants to evacuate from the building and prior to calling the fire department. There was no evacuation plan establishing fire emergency procedures for the complex, and employees were not schooled or drilled in duties they would perform in the event of a fire.
- The number of people in the Cabaret Room exceeded by about triple the number of occupants that the room could safely accommodate. Also, the number of occupants in the Beverly Hill complex (total) on the night of the fire exceeded about double the number of people that the building could safely accommodate.
- The capacity of the means of egress for the Club and especially for the Cabaret Room was not adequate for the occupant load based on square feet per occupant, or for the actual number of occupants that were in the building at the time of the fire.
- The interior finish in the main north-south corridor exceeded the flame spread allowed for places of assembly in NFPA 101[®] *Life Safety Code*[®] and contributed to the rapid spread of fire from the Zebra Room to the Cabaret Room.
- The Beverly Hill Supper Club was not provided with automatic sprinkler protection as required by codes in effect at the time of the fire.

Happy Land Social Club
New York City
March 25, 1990
(Alert Bulletin – Originally Published in May, 1990)

An early morning fire at the Happy Land Social Club in New York City's Bronx borough, resulted in 87 fatalities. The club was an establishment where patrons, mostly from the immediate neighborhood, could listen to music, dance, and purchase alcohol. However, the club was operating in violation of the city's regulations and was ordered to vacate the premises based on building and fire code deficiencies. This incident was the worst fatal fire in New York City since the Triangle Shirtwaist Company fire in 1911 and the worst in the United States since the Beverly Hills Supper Club fire in 1977. The National Fire Protection Association cooperated with the Fire Department of New York City in documenting this incident.

The building was of ordinary construction, and its overall dimensions were approximately 24 feet by 60 feet. Access for fire fighting was from the front (street side) where two entrance doors were located. This structure was among a row of similarly constructed single-story occupancies occupying most of the city block. Construction arrangements suggest that the building may have once been subdivided at its center into two separate tenant areas. Furthermore, at one time the structure was one-story in height with a 20-foot ceiling, but a second floor was later added. Floor/ceiling joists for the added second floor were installed at approximately the 10 ft. level. When this alteration was done, the existing automatic sprinkler system was not extended to the first floor, and one of the branch lines on the second floor was plugged, further limiting coverage on the second floor.

Doorways from the building were positioned at the north and south ends of the front of the club and discharged onto the sidewalk. Each exterior opening had a 36-inch metal clad door, which could be covered during nonbusiness hours by a steel roll-up security door. At the time of the fire, the steel door at the north entrance was down and apparently unlocked. Further, the doorway was not marked and its presence was most likely not known except to employees. In addition, the doors were reported locked at the time of the fire making it an unusable exit for patrons. Each exterior door opened into a foyer containing an additional metal clad door that led to patron areas. All four doors swung in the direction of exit travel and each had dead bolt latches. The south door was the main entrance and the only available exit for patrons. Under this arrangement, patrons flowed into the 15-foot-long foyer where they paid an admission fee before moving into the club proper. Payment was made to a club employee located in the coat check room through an opening in the frame partition wall. Once inside the club, patrons could check their coats from the club interior side of the coat check room. The temperature on the night of the fire was cold, and a substantial number of coats were located in the coat check room.

Beyond the coat check area, several tables and chairs were provided in the approximately 12-foot wide area beyond which the area doubled in width. Located in

this area were a bar, the rear stairway to the second floor, and a room (separated by an interior partition with openings) containing table and chairs.

Similar to the first floor, the second floor was divided into two parts. The south side of the floor contained a bar, tables and chairs, and a small office at the front of the building. The north side had a dance floor, a sitting area, stage, and a disk jockey booth.

Two unenclosed stairways provided access to an egress from the second floor; one located at the front of the building close to the coat check room and one at the rear of the building. At the base of the front stairway was a hollow core wood door, which suggests that primary patron access to the second floor was by means of the rear stairway. The front stairway was comprised of a “ship’ ladder” stair arrangement with very narrow treads. Access to the stairway from the second floor was in the vicinity of the disk jockey booth. The floor opening created by the stair shaft at this level was surrounded by an iron railing with a grate. An exit sign was mounted over the stairway.

Access to the rear stairway from the second floor was located near the bar area. In addition to the uneven riser height encountered, travel over this stair required a 90° turn, and the width of the stairway narrowed to approximately 19 inches at one point.

All interior walls including the entrance enclosures were covered with 3/16-inch wood paneling nailed mainly to wood studs. The ceiling finish throughout most of the building was gypsum material; however cellulose fiber ceiling tiles were located in the first floor bar area. A manual fire alarm system was installed in the building. (Its operational status had not been determined at the time this bulletin was originally published.) The partial automatic sprinkler system mentioned earlier, covered only one-half of the second floor, which was not in the area of fire origin. Its operation was not a significant factor in the outcome of the fire.

Investigators from the New York City Fire Department have listed the cause of the fire as arson; early reports indicate that an accelerant was poured in the main entrance area and ignited. Apparently, the fire was first observed by an employee in the coat check room adjacent to the entranceway who shouted “fire.” She and another employee in the coat check room left the room and were joined by two patrons who were waiting for their coats. Because she knew of an alternate way out and since she had a key to unlock the doors, the four left the building by the north exterior door. Another employee, believed to be a “bouncer,” went to the second floor to notify patrons of the developing fire. Two survivors, the only known survivors from the second floor, apparently left immediately down the front stairway. One survivor left by way of the north exterior door (which was in the open position because of prior use), and the other reportedly ran through the flaming main entrance, sustaining critical burns. During this time, the fire spread to the combustible interior finish materials spreading heat and smoke throughout the club and to the second floor, mostly by mean of the rear stairway.

At about 3:41 a.m., the fire was reported to the fire department via a Emergency Response System (ERS) box, which is incorporated an interactive voice reporting system. The first units to arrive were Engine 45 and Ladder 58 (which arrived in 2:25 minutes because it was returning from another alarm, and Battalion Chief 18. Upon their arrival, they reported that the fire was venting from both doors. An initial attack was begun with a 2-1/2 inch handline, and the fire was “knocked down.” This rapid response and attack by the fire department limited the fire damage to the front portion of the first floor.

Fire fighters then began searching the interior and discovered several bodies located near the entrance and the second floor. As the search continued, they realized the severity of the loss of life. Investigators determined that a total of 18 patrons were found at various locations on the first floor, and 69 patrons were found at various locations on the second floor.

Following the fire, task force groups made up of representatives from New York City’s police, fire and building departments, began a citywide sweep to identify illegal clubs, inspect them for compliance with building and fire codes regulations, and to vacate those found to have deficiencies or to be unlicensed

The Happy Land Social Club did not meet the applicable portions of the New York City Building Code, and prior to the fire and order to vacate the property had been issued to the club.

Based on the preliminary information (available at the time that this bulletin was published), it appears that the incendiary fire located at the entrance immediately blocked the only available exit from the club. In addition to the accelerant, combustibile interior finish was a factor in fire and smoke spread beyond the area of origin. As a result, smoke and heat quickly spread to the second floor, via open stairs, where most of the victims were found.

This deadly scenario has been documented in other lounge and social club fires investigated by NFPA including the Bronx, NY Social Club fire of October 23, 1976¹ (25 killed) and the Upstairs Lounge fire, New Orleans, LA, June 24, 1973² (32 killed).

Building and fire officials responsible for code enforcement in this and similar types of occupancies need to closely review the level of fire protection prescribed by applicable building and fire codes that cover similar occupancies to ensure that adequate levels of protection are provided.

¹ Best, Richard, “Social Club Fire, Bronx, NY,” *Fire Journal*, May 1977, National Fire Protection Association, Quincy, MA.

² Willey, A. Elwood, “The Upstairs Lounge Fire, New Orleans, Louisiana,” *Fire Journal*, January 1974, National Fire Protection Association, Quincy, MA

**National Fire Protection Association
Fire Investigations Department
PO Box 9101
1 Batterymarch Park
Quincy, MA 02269 USA**

**(617) 984-7263 (tel)
(617) 984-7110 (fax)**

**e-mail: investigations@nfpa.org
www.nfpa.org/Research/Fire_Investigation/fire_investigation.html**

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