

extinguishers were malfunctioning. The venue was overcrowded. Having only one exit, the venue was a dead-end configuration.

3.9 Gothenburg Dancehall, Sweden, 1998

On October 28th 1998 a fire incident during a Halloween party in a dancehall in Gothenburg occurred. The dancehall was located on the 2nd floor. The fire originated in one of the two staircases leading to the dancehall, where furniture was stored. In this incident, 63 people died and 180 were injured. Official investigation reports by the Swedish government as well as the NFPA are the main sources for the analysis [89], [90].

Description of the Building and the Situation Prior to the Fire

The free standing building was built in the 1930's and had several different types of occupancy in its lifetime, but also when the fire occurred [90]. The part in which the party was held had two storeys, while the other part of the building had only one. In the 1990s the second floor was converted into a dancehall. It was not a regular nightclub. The building had two exits which had illuminated signs above the door. Apart from the exits there were eight unobstructed windows on the northeast side of the building which were 2.2 m above the floor. The windows had dimensions of 1.8 by 0.8 m. Three of these windows had a vertical drop of 6 m to the ground level; the other five were above an adjacent roof. There were five windows on the opposite side, but they were secured with bars.

In the building there was one main staircase directly leading to the outside and one rear exit leading to a corridor in the single storey part of the building [89]. Right in front of the main staircase on the second floor there was a ticket desk as well as two other tables in the corridor. A stage was located at the rear exit. The DJ booth was located on the stage.

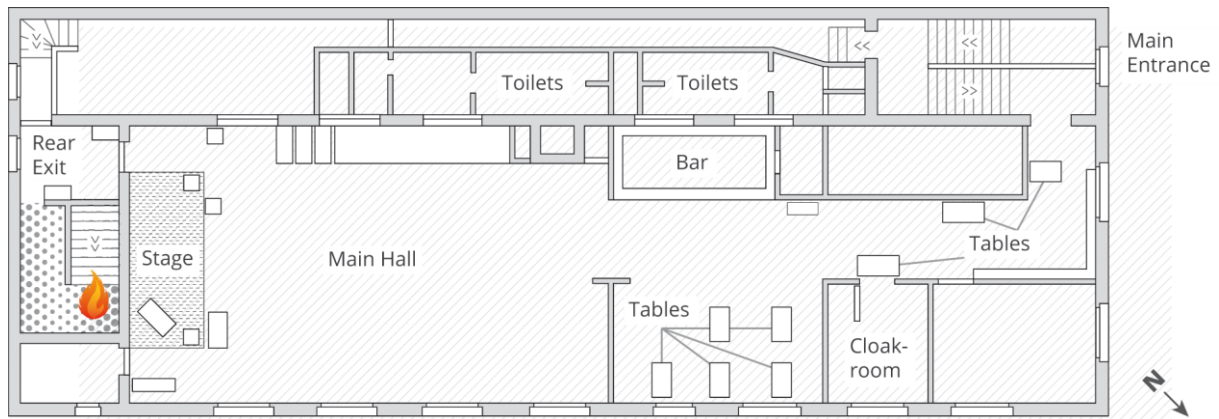


Figure 10: Layout of the dancehall in Gothenburg; The flame indicates the origin of the fire; Figure based on [89]

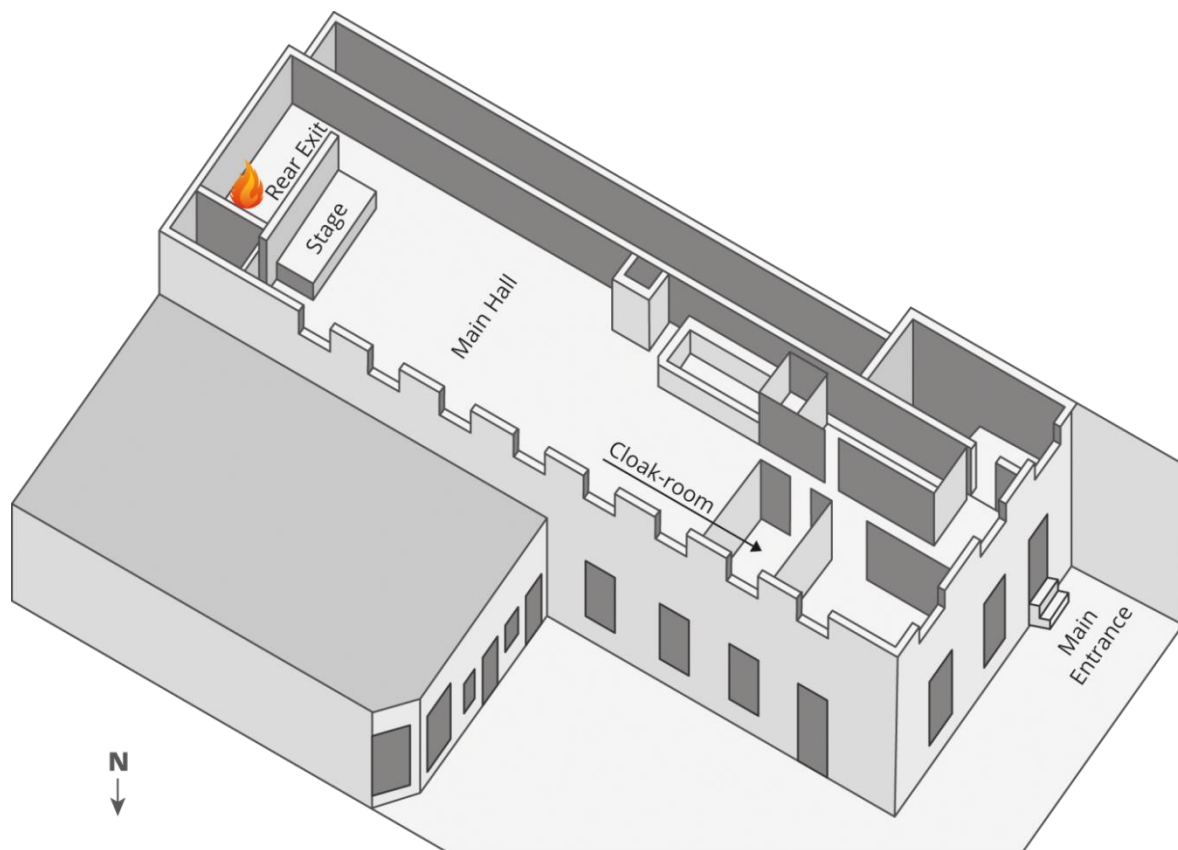


Figure 11: 3D layout of the dancehall in Gothenburg; The flame indicates the origin of the fire; Figure based on [90]

The building did not have any detection and alarm system or automatic suppression system. Fire extinguishers are not mentioned in the reports. The ventilation of the room was controlled by an exhaust fan with a capacity of 3800m³/h. It is unknown whether the ventilation was on or off on this particular night. Additionally, two fans were located in the kitchen [89].

The building was mainly built out of concrete and masonry block. Suspended acoustic tiles were used for the ceiling. Flags and other decoration were reported to have been in the main

hall. *“The interior wall finish was non-combustible plaster finish and possibly combustible wood panelling”* [90]. Several chairs and tables, which were partly made of combustible material, were located in the main hall. Many tables, chairs etc. were moved from the main hall to the rear staircase to make more space for the party. The main fire load was located in the rear staircase. The fire load within the dancehall was relatively small [89].

The estimated minimum number of occupants was 398 [89]. In the aftermath of the fire the local fire department stated that they would have allowed only 150 people into the party in order to ensure a safe evacuation. Witnesses stated that the party was overcrowded. There are reports of people stating that it was not possible to dance and that people were standing shoulder to shoulder [90].

In 1998 in Sweden it was necessary to get a permit for a party where admission is charged. The fire service then would have estimated the maximum number of allowed occupants. In the case of this party, no permit was obtained. Tickets were sold. The party therefore happened illegally [89], [90].

Description of the Incident and Human Behaviour

In the aftermath it became apparent that the fire was arson committed by four teenagers who were denied to enter the party [91]. The fire originated in the rear stairwell. Combustible materials, mainly wooden furniture, were stored in the rear stairwell to make more room for the party. From there the fire spread into the main hall and ignited the furnishings and decorations [90].

The fire was manually detected by one of the two DJs who opened the door to the rear staircase and saw the fire. It is not certain whether he was the first to detect the fire or not. It is unknown whether he closed the door after his discovery or left it open. The fire brigade was alarmed at around 23:42. Two instructions were made by the DJs. One was: *“Fire, Run, Out”* while the second one was *“Fire, don’t panic, take it easy, but everybody should go”*. Some people followed that advice while most remained dancing [89]. The DJs started disconnecting their stereo equipment. After one of the DJs realized he would not be able to make it through the dense crowd in time, he broke a nearby window and jumped on the roof of the adjacent building [90]. The music kept playing. The announcement of the fire was commented on as being “cool” by an unknown person via microphone. Somebody started rapping a popular

song. People continued dancing afterwards. The DJ gave out another warning. He seemed to be stressed.

Some witnesses mentioned popping light bulbs and seeing smoke as first cues to the presence of a fire [90]. Others mentioned smelling the smoke and being irritated by it, as first cues. Some mistook it for a smoke machine. One patron wanted to investigate the ambiguous cues further and checked whether the fire was a real threat or not. He burned himself at the doorknob and left the door partially open. When black smoke entered the room everybody rushed to the exit [89].

Out of the survivors that were interviewed after the incident, 62 occupants took the first warning serious while 159 did not. For 88 people data is missing. Survivors stated that especially the ticket desk at the main staircase had caused problems and slowed down the evacuation for about a minute. The high pressure on the main entrance resulted in a crowd crush [89].

When the fire fighters arrived at around 23:49 p.m. a large number of people were outside of the building blocking access to the scene. The officer had to walk in front of the fire truck and instruct people to clear the way [90]. The crowd was actively hindering the work of the fire fighters. There are reports of fire fighters being assaulted. *“Police officers were required to restrain and control the crowd to allow fire personnel to operate”* [90].

Several people jumped out of the windows in the second floor that had a 6 m vertical drop. After jumping or being pushed by those behind them they lay injured on the ground, which made it impossible for the fire fighters to place ladders and operate quickly. Twenty-three were found dead in a room that served as the cloakroom close to the staircase. Some entered voluntarily while others were pushed inside because the pressure on the main escape route was immense [89]. Most of the fatalities were due to inhaling smoke [90].

The investigation board of the incident found that if there would have been a detection system in the staircase the disaster would have been most likely avoided [89].

Identified Critical Factors

The organizers failed to get permission for the party and operated illegally. The arsonists were able to start this fire because there was enough fuel stored in the rear exit. There was no