

# Factual account

## 1 Course of events

### 1.1 The dance party

Several youngsters in Gothenburg had decided to arrange a dance party for the evening of Thursday 29<sup>th</sup> October 1998 in connection with All Saints weekend. For this purpose they hired the premises of the Macedonian Association stating that they were going to have a private birthday party. The premises were let to the Macedonian Association by the owner of the property, and were situated in an industrial building that had undergone alterations and contained the locations for several businesses, e.g. the Backa Theatre and a number of shops. Youngsters in the Gothenburg area were informed about the upcoming party via the distribution of flyers.

At 1800 on the Thursday four or five youngsters met at the venue to prepare it for the party. In order to increase the free floor space they moved tables and chairs and placed them along the walls. In addition some of them were placed in the venue's emergency exit stairwell. A smoke machine had been acquired. So as to dim the lighting, cardboard boxes were placed over some of the lamps.

The public started to come in at about 2100. The arrangers charged an entrance fee, which was paid at a table that had been set up directly inside the main entrance to the venue.

During the evening more and more youngsters came to the party. Subsequently it has been ascertained that just after 2330 there were approximately 375 youngsters inside the venue. According to information from the police and partygoers spirits and drugs were not in evidence to any great extent amongst those at the party.

### 1.2 The fire

#### 1.2.1 The premises of the Macedonian Association

Four young men who during the evening had started a fire in the emergency exit stairwell were later convicted of arson.

At some time between 2325 and 2330 some youngsters noticed a strong and unpleasant smell. A few minutes later some of them smelt smoke and they assumed that it was coming from the smoke machine, while others thought that one of the lamps had begun to burn. Someone noticed smoke coming in under the door from the emergency exit and the door was opened. It was realised then that there was a fire in the stairwell. One of the DJs informed the partygoers about the fire over his microphone. The emergency exit door was re-opened and remained open. The fire then spread rapidly into the dance hall from the stairwell. At 2342 one of the DJs rang the 112 emergency number on his mobile phone. The youngsters began to evacuate the venue. Most of them made for the entrance door but that area soon became packed with people to the extent that it was difficult for people to move. In the small passage between the cafeteria and the exit many people fell to the floor. Several ended up in the room that was being used as a cloakroom. By the entrance door there was a table, at which a tight group of people formed thus completely blocking and preventing its use as an exit. Youngsters in the main stairwell managed to pull free several of those who were gradually getting stuck in the door opening. Some youngsters were able to escape via various windows, despite the windows being quite high up.

#### 1.2.2 The spread of the fire

The fire spread to the roof on the west side of the building and to the Backa Theatre. At 2357 the theatre's automatic fire alarm activated. An employee who was sitting working in a room close to the actual theatre hall heard the alarm. He went out into the theatre and encountered grey smoke, immediately after which he saw flames in the join between the wall and the ceiling. He fought the fire himself with a hose from an indoor fire hydrant and after a while got the fire under control, but it flamed up again so he had to re-attack it. He called a colleague who arrived on scene very quickly and helped him.

Some time between 0035 and 0045 they both went out into the passage that was the common emergency route for the Macedonian Association and the theatre. They went to the door to the stairs that formed the emergency route for the Macedonian Association. This door was ajar and inside they could see that the fire

was raging. They made an attempt to extinguish it, but realised it was hopeless. As they were leaving that area they shut the door so that it locked.

### **1.3 The fire and rescue operation**

At 23.45.40 the first fire & rescue crew turned out of Lundby fire station. They arrived on scene at the fire at 23.49.40. When the first fire engine swung round the corner towards the scene of the fire the rescue commander saw youngsters running towards his appliance, screaming and waving their arms about. There were injured and uninjured youngsters on the ground in front of the building. Flames were coming out through several windows. People were visible at two windows. Youngsters were jumping and landing on the ground, a drop of about six metres. The whole place was in chaos.

The crew from Lundby immediately began trying to get youngsters out of the building. Fire fighters using BA were working partly in the entry stairwell, and partly through a window, on the short side of the building, which gave access to the passage. A ladder was raised to the cloakroom window. Gradually other fire & rescue crews arrived on scene. The rescue work continued with the purpose being to save lives. In total, fire fighters removed 60 to 70 youngsters from the building. After it was verified that there were no more people left in the building to rescue, the decision was taken at 0030 to extinguish what remained of the fire. The fire was recorded as extinguished at 0202. Then fire fighters carried out the deceased from the building.

The first police patrol arrived on scene just before the Lundby crew. Police manpower was gradually increased and they helped, amongst other things, to keep order, direct traffic and to make a gap in the fence to facilitate access to the scene for the ambulances.

The injured youngsters were transported to hospitals in the Gothenburg area. Those with slight injuries and the uninjured were driven away from the scene in buses. Fire fighters, ambulance crews, a medical team, and the city doctor on-call gave medical treatment at the scene.

A total of 63 youngsters perished in the fire, and about fifty sustained serious physical injuries.

# 18 Statement

## 18.1 Result of the investigation

### The incident

- Several youngsters had arranged a dance party for the evening of Thursday 29<sup>th</sup> October 1998, for which purpose they temporarily hired premises from the Macedonian Association. During the evening four young men deliberately started a fire in the emergency exit stairwell amongst the chairs that the youngsters organising the party had taken out from the dance hall. The fire developed unhindered and when it was later discovered its intensity was so strong that the dance hall was rapidly filled with smoke and flames. At this stage there were at least 375 youngsters in the dance hall. Of these 63 perished and 213 were taken to hospital. Among the injured were 40 who had injuries that required at least a week's medical care; many of these injuries were of a serious nature.

### The building and fire prevention arrangements

- The venue and annexed additional areas had a total area of approximately 300 m<sup>2</sup> and were located in an industrial building which had been altered and contained many various operations i.e. a theatre, shops, and a craft workshop.
- The building was constructed of brick, with two complete floors and a middle floor. Stairs and joists in that part of the building were made of concrete. Partition walls were made of brick. Newly erected walls were constructed of plasterboard on wooden frames. The outer roof was supported by concrete beams, and was made up of lightweight concrete plates covered with damp proofing and on top of that, outermost, was roofing-felt.
- The building permit for the original building was granted on 20<sup>th</sup> April 1943 and permission for extension was granted on 6<sup>th</sup> June 1950. On 16<sup>th</sup> January 1990 the Macedonian Association was granted a building permit for use of the premises for Association activities. The local building committee in granting the permit did not specify a limit for the number of people that could be present in the premises at the same time.
- The premises had two emergency exits in the form of doors leading to separate stairwells i.e. the entrance stairs and the emergency exit stairs.
- The door opening to the entrance stairs had a usable width of approximately 0.83 metres. The door and doorframe to the emergency stairs were consumed during the fire, but the width of the opening in the wall confirms that this door opening was of the same width as the other.
- According to regulations applicable to this type of premises, a maximum of 150 people were permitted to be present in there at the same time, due to the fact that both door openings had widths of less than 1.2 metres.
- The windows in the premises were approximately 2 metres above the level of the floor. The window facing the Backa Theatre was fitted with a grill.
- Surface demands for the surface of the ceiling and the upper parts of the walls were met. On the lower parts of the walls wooden panelling was attached directly to the foundation of the building. This was a minor deviation from the demands for building surfaces.
- The floor was covered with linoleum of average quality, which as a rule is approved for use as floor covering.
- The lowered ceiling – below the lighting shaft – towards the theatre, was in parts constructed as a wooden frame covered with pasteboard.
- After the inspection of fire prevention arrangements on 17<sup>th</sup> January 1989 the owner of the building was ordered, among other things, to install windows of class F30 in the upper floor of the Backa Theatre in order to prevent the spread of fire to the theatre. Instead the whole wall was covered with metal sheeting, which was fitted with non-flammable insulation. The sheeting was attached to a wooden frame. This construction was not able to prevent the spread of fire.
- Storage facilities had been built in both stairwells. The store in the entrance stairwell was not fire-isolated from the stairwell to the prescribed class. The store in the emergency stairwell was completely destroyed during the fire; it has not been possible to determine to what extent it had been fire-isolated from the stairwell.

- The premises were equipped with two indoor fire hydrants, of which one was functional.
- The emergency power supply for the emergency exit signs was not working. There were, however, no demands requiring such a power supply for these premises.
- The automatic door-closer, prescribed in the building regulations for the door to the emergency exit stairs, was not working during the fire.
- The doors from the venue to both stairwells had no handles on the inside by which to open them. In addition, the door to the entrance stairs could with one single manipulation be changed so that the latch would lock the door automatically when someone shut the door. In this respect the requirement that doors should be easy to open were not met by these doors.
- The premises had been the subject of prescribed inspections of fire prevention arrangements in 1991, 1993, 1995 and 1997. To what extent the ordered measures were taken cannot be determined, due in the main to shortcomings in maintenance.
- There was no documentation detailing what fire fighting equipment existed in the premises, with for example information on the number and location of emergency exit signs and the number of indoor fire hydrants.

### **The party**

- It was a privately arranged party, entry to which was on payment of a fee.
- The venue was hired from the Macedonian Association
- Neither the relevant authorities nor the leaser had documentation detailing limitations on the number of people that could be present in the venue at the same time.
- Furniture was moved around and chairs were carried out of the hall and placed in the emergency exit stairwell. A small table, i.e. the ticket table, was placed by the entrance door. Another table was placed in the door opening of the cloakroom, the section room, and a third table was placed in the passage.
- To dim the lighting cardboard boxes were placed over certain lights. During the party a smoke machine was used.
- Shortly after 2330 there were at least 375 youngsters inside the venue.
- According to information from the police and partygoers spirits and drugs were not in evidence to any great extent amongst those at the party, this was corroborated by samples taken from the deceased.

### **The course of the fire**

- The fire was deliberately started on the landing on the emergency exit stairwell and spread to the chairs that the youngsters had placed out there.
- The door between the emergency exit stairwell and the emergency culvert was not closed.
- The fire grew while there was sufficient oxygen, but then subsided in intensity when the combustible gases were pushed down the stairwell due to the lack of an opening in the upper part of the stairwell. The fire became under ventilated and its effect decreased to a low intensity. Simultaneously a mass of unburned gases collected in the upper part of the stairwell. These gases were not hotter than 200 degrees C.
- The leakage of hot gases into the dance hall through gaps round the door and doorframe, and out between ceiling joists and the roofs lightweight concrete plates had no determinable effect on the course of the fire.
- When the door to the dance hall was left open the accumulated warm gases mixed with oxygen, which resulted in the fire spreading into the dance hall and on to other areas. Before the windows broke excess pressure built up, in the main through thermal expansion, which meant that the combustible gases were able to reach as far as the entrance door.
- When the door to the dance hall was left open, a large vortex of warm gases was created which poured into the dance hall, and the flow of air coming in from the lower door increased. The fire in the stairwell grew rapidly and once again became under ventilated.
- Within a matter of minutes the radiant heat from the warm gases ignited the floor covering nearest to the emergency exit stairs and the wooden panelling on the lower part of the walls. The fire spread like a surface fire along the floor and the wall panelling as far as the passage.
- Within a matter of minutes combustible gases had filled that part of the venue that was closest to the emergency exit stairs. The pressure in the venue rose with the increasing temperature and the fast spread of the combustible gases. Within the space of a few minutes the carbon monoxide in certain parts of the venue had already reached dangerously high levels.

- New exit routes were created for the combustible gases nearer to the fire centre when the windows broke. The smoke began to pour out through the windows. The colder and heavier air came in through the windows furthest away from the fire. This improved the chances of survival in the passageway.
- The flames, which had forced their way into the venue, spread out under the ceiling towards the cafeteria. The large flames subjected all surfaces in the venue to extreme radiant heat and carried a risk of burns to people and the ignition of combustible material. Pressure from the hot combustible gases was quickly counterbalanced when the door to the venue was opened. At the same time, air poured in through the open door to the passage due to the under pressure that occurred as the oxygen was used up in the fire. As a result of which the fire increased further and developed a heat effect that would have been over 20 MW.
- The stairwell became a large carburettor, in which only a small amount of the gases produced were burned off.
- The ventilation conditions changed during the fire partly when the door from the venue to the emergency exit stairs was left open, and partly when the windows in the venue broke. This meant that concurrent with those in the venue receiving fresh air, the fire increased in intensity resulting in more burn injuries.
- The hot gases caused the glass partition between the cloakroom and the passage to break. The cloakroom then rapidly filled up with gases.
- The spread of the fire to the Backa Theatre occurred when radiant heat and flames from the fire ignited the wooden joists inside the wall. Hot gases poured in through gaps between the wall and ceiling in the theatre and ignited.
- The actions of the two theatre employees meant that damage to the theatre was limited to smoke and water damage only.

## Evacuation

- The first urgent request from the DJ to evacuate the premises was clear and direct. Many of those standing nearest to the stage attempted to leave the venue while others remained where they were.
- The effect of the urgent request to evacuate the venue was partly deadened by other signals that contradicted it. This delayed evacuation. Many youngsters moving towards the exit and some in the opposite direction made the situation more difficult.
- When the smoke made the threat visible the crowding increased rapidly. Many felt that they couldn't control their own movements but were, in the crush, being forced one way or the other.
- Some people reached the door opening by climbing along the hat shelves that were situated along the walls in the passage.
- The ticket table that was placed by the entrance door meant that access to the door was tight. Someone turned the table around but due to the press of people the table was moved and finally broken up.
- A tight group of people blocked the door opening to the entrance stairs.
- None of the youngsters that jumped or were pushed out of the windows were believed to have died from injuries incurred from the fall, despite the fact that the windows were approximately six metres above ground level.
- More than 100 youngsters were rescued by their friends dragging them out of the venue.
- At least 20 youngsters died in the room that was being used as a cloakroom.

## The fire and rescue operation

- The alarm call at 2342 included no street address but referred to the Macedonian Association, Backaplan and Sängjätten.
- The operator didn't fully understand the situation. The fire & rescue service, therefore, wasn't alerted in accordance with the routines in force for fires in this type of premises.
- The first crew, at Lundby fire station, got the call out at 2345 and were on scene at the fire after four minutes.
- En route to the fire the station officer with the Lundby crew requested back up from another station as soon as he saw the smoke from the fire at a distance. The controller called out a crew from Gårda.

- On arrival the Lundby station officer ordered his crew to conduct life saving operations only. The first operation was carried out via the entrance stairs and with a ladder.
- Immediately after arrival the Lundby station officer requested further assistance. Another crew, partly reduced, was called out from Gårda.
- The fire alerting centre (Brand-AC) did not call out in full those resources that the officer requested. The officer didn't check to confirm that the requested resources had been called out.
- The fire & rescue service took 60 – 70 people out of the premises using BA and external ladders.
- During the first hour of the rescue operation the fire & rescue service did not investigate the possibility of a risk of the fire spreading to other properties. Neither did they investigate the emergency exit culvert during that period.
- The fire & rescue service performed no fire extinguishing operations in the theatre, but when back up arrived they helped to ventilate the theatre to allow the smoke to escape.

### **Medical operations**

- The first ambulance got the call out just after the first fire & rescue crew. An OLA ambulance got the call out a few minutes later.
- During the initial phase the ambulance resources available were not put to full use.
- During this accident the “load and go” principle was applied.
- In the first ambulances to “load” several injured people travelled in each vehicle.
- Due to the large number of people injured many received medical care at the scene from – apart from ambulance personnel – medically trained fire fighters, police officers, and friends. The city doctor on-call also administered medical treatment at the scene.
- At 0010 the fire & rescue service prepared to enter a car showroom, where the collection point for the injured was established.
- A medical team arrived at 0029. Another medical team arrived at such a late stage that most of the injured had already been taken to hospital.
- The command doctor was never called out.
- As time went on an ambulance officer co-ordinated the ambulances.

## **18.2 Conclusions**

### **Factors which contributed to the outcome of the fire**

A number of factors contributed to the disastrous outcome of the fire. Those factors that the Swedish National Board of Accident Investigation assessed as being the most important are listed below. The factors have not been ranked in order of importance.

- There were many more people in the premises than the emergency exits were dimensioned for.
- The emergency exit stairs were blocked and contained between one and two tons of combustible material.
- The placing of the combustible material in the emergency exit stairwell and the place where the fire was deliberately started provided the conditions for an intensive initial fire.
- The door between the emergency exit stairs and the culvert was open after the fire was started, which allowed air to flow in.
- The fire was able to develop for 10 to 20 minutes before it was discovered.
- The door closer for the door between the emergency exit stairs and the dance hall was not working.
- Before the door to the dance hall was opened the fire was under ventilated and had developed large amounts of unburned combustible gases which created an over pressure in the upper part of the stairwell.
- When the door to the dance hall was left open the hot gases quickly spread into the venue, mixed with the air and were ignited by the fire in the stairwell. After which a chimney effect resulted in the emergency exit stairwell that led to a very fast spreading of the fire.

- The geometry of the emergency exit stairwell led to the creation of a vortex by the combustible gases, which resulted in a rapid ignition of floor and wall material in the dance hall.
- Evacuation was delayed due to unclear signals concerning the severity of the situation.
- Thick smoke and toxic combustible gases made evacuation more difficult.
- The only remaining evacuation route was partly blocked by a table.
- A tight group of people lying on the floor got stuck in the door opening.

### **Other factors that may have contributed to the outcome of the fire**

In the analysis a number of other factors that may also have contributed to the outcome of the fire have also been discussed but it hasn't been possible to verify if that was the case. The factors here have not been ranked in order of importance either.

- A misunderstanding occurred in connection with the emergency call to the emergency services switchboard (SOS AB) and the fire alerting centre (Brand-AC), and so the fire & rescue operation was delayed by about two minutes.
- The chaos at the scene made the rescue work more difficult.
- The fire alerting centre didn't call out all the resources that were requested from the scene, and the officer on scene didn't check to ensure that the requested resources had been called out.
- The operational command of the rescue operation was unstructured and lacked support staff.
- No fire extinguishing took place during the life saving period of the operation.
- The external life saving operation via the cloakroom window was not accomplished.

# Recommendations

## 19 Recommendations

The Swedish National Board of Accident Investigation recommends

### **The Swedish National Board of Housing, Building and Planning to:**

- Consider whether the methods used for the dimensioning of evacuation routes ought to be renewed. In connection with which the relationship between number and width in evacuation routes ought to be particularly investigated (*RO 2001:02 R1*).
- Consider whether especially high demands ought to be placed on fire prevention arrangements in premises used for gatherings that are situated or constructed in such a manner as to make evacuation more difficult (*RO 2001:02 R2*).
- Consider introducing requirements for automatic fire alarms in premises used for gatherings and in such adjacent unoccupied spaces (*RO 2001:02 R3*).
- Consider introducing requirements so that a “highest number of people permitted” clause can be specified, even for public premises that are permitted to hold less than 150 people (*RO 2001:02 R4*).
- After consultation with the Swedish Rescue Services Agency, consider to what extent fire prevention regulations for premises used for gatherings ought to apply retroactively (*RO 2001:02 R7*).
- Investigate how effective the standardised warning signals are (*RO 2001:02 R6*).

### **The Swedish National Board of Housing, Building and Planning and the Swedish Rescue Services Agency to:**

- Works towards demands on fire prevention arrangements being based on the possible uses of premises (*RO 2001:02 R7*).

### **The Swedish Rescue Services Agency to:**

- Work towards the implementation of the requirement to appoint a person responsible for fire prevention arrangements in every premises used for gatherings (*RO 2001:02 R8*).
- Work towards the implementation of demands being placed on the owner or proprietor of a premises used for gatherings to draw up fire prevention documentation (*RO 2001:02 R9*).
- Work towards the development of clear routines for incoming emergency calls, the alerting of the rescue services (call out), documentation, information management, radio communications, the division of work, and co-operation in alarm and command centres during rescue operations (*RO 2001:02 R10*).
- Work towards the development of technical aids and their use so that they support and simplify important tasks, e.g. effective alarm handling, alerting several stations simultaneously, radio and telephone communication, and information management and documentation (*RO 2001:02 R 11*).
- Work towards the development of a system that could, during a rescue operation, quickly reinforce the operational command at the scene, as well as the strategic command in the support base, with sufficient resources (*RO 2001:02 R12*).
- Work towards documenting, in alarm and command centres, the identity of the rescue commander at all times during a rescue operation (*RO 2001: 02 R13*).
- Ensure that officers in the operative fire & rescue service receive further training and practice in decision-making during and command of operations in rapidly changing, complicated and dynamic situations (*RO 2001:02 R14*).

### **The Swedish Rescue Services Agency and the Swedish National Board of Health and Welfare to:**

- Work towards clarity between the medical service and rescue service organisations when it comes to the use of nomenclature and branch specific terms and expressions (*RO 2001:02 R15*).
- Look over the prevailing principles for the fire & rescue service and the ambulance service as regards radio and telephone communication with alarm centres and hospitals respectively. In connection with this particular attention ought to be paid to the fact that several people ought



to have the possibility to listen to the calls and that they ought to be recorded (*RO 2001:02 R16*).

**The Swedish National Board of Health and Welfare to:**

- Work towards improved routines that can ensure that a large number of ambulances can quickly arrive at an incident site, and that can also ensure the rapid reinforcement of ambulance resources (*RO 2001:02 R17*).
- Work towards improved routines that can ensure that alarm centre and support staff personnel and hospitals, at an early stage of an incident, and then continuously, receive necessary information on the situation at the incident site (*RO 2001:02 R18*).
- Consider how to improve routines for operations with medical teams or other units that can offer qualified medical care at an incident site (*RO 2001.02 R19*).
- Look over the prevailing principles for medical command at an incident site with consideration to the need for medical and organisational competence, familiarity with the work of the fire & rescue service and the medical services, and the ability to work in an extreme environment with insufficient resources (*RO 2001:02 R20*).

**The Swedish National Agency for Education to:**

- After consultation with the Swedish Rescue Services Agency, consider to what extent general knowledge on risks in society, and on how they should be handled, ought to be included in the curriculum for the nine-years of compulsory schooling. Consideration should also be given to how these knowledge goals can be achieved in the best possible way (*RO 2001:02 R21*).