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The Station Nightclub Fire – An Analysis of Witness Statements

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ABSTRACT

Pyrotechnic devices activated in a small nightclub ignited a fire that killed 100 people and injured at least 200 others in February, 2003. The National Fire Protection Association (NFPA) and the National Research Council of Canada (NRCC) undertook a research project to study the behavior of building occupants in this incident as they evacuated the building.

The analysis was based on a content analysis of witness statements collected by various police agencies after the fire. Statements were available from 355 survivors present in the building at the time of the fire. This paper summarizes their reactions and responses, exit route choices and travel paths.

KEYWORDS: human behavior, egress, emergency decision making

INTRODUCTION

On February 20, 2003, pyrotechnic gerbs ignited a rapidly-spreading fire in a crowded nightclub in West Warwick, Rhode Island, killing 100 people and injuring at least 200 other of the more than 400 occupants of the club. The devices were set off on the stage at the beginning of a rock concert and ignited combustible foam material on the walls and ceiling surrounding the stage area. The small structure was engulfed in flames within five minutes. The fire ignition and development, as well as some of the occupants' responses, were captured on film by a cameraman from a local TV station who was taking film footage for a planned news story on bar safety.

Over the course of several weeks following the incident, police investigators compiled almost 400 witness statements, primarily from occupants of the building or people on the premises at the time of the fire. For this project, researchers from NFPA and NRCC used these witness statements as the basis of a study of the behavior and responses of occupants of the nightclub the night of the fire. Although witness statements do not provide the scientific rigor of a survey-based project, the detail in the statements can provide important insights into the experiences, reactions and decisions of the survivors. For example, police interviews were used successfully to study occupant behavior in the Beverly Hills Supper Club in 1977 [1].

The authors followed a content analysis methodology similar to that used in studying media accounts of occupant evacuations from the World Trade Center in 2001 [2]. To analyze the witness statements, a "questionnaire" was developed and used to "interview" each statement. Data of interest in the statements included the person's familiarity with the club, their time of arrival, their recollection of the sequence of events and their own actions, their observations of the actions and reactions of others, their escape route, injuries (if any), intoxication (if any), as well as demographic detail. Based on the responses received, a coding scheme was devised, the accounts were coded and the coded responses were analyzed.

DESCRIPTION OF THE BUILDING

The Station Nightclub was a small venue with outside dimensions of approximately 21 meters by 24 meters (see Fig 1). On the west side of the structure was a raised platform that served as a stage for live concerts, an area by the windows with pool tables (labeled 'sunroom'), a dance floor, a raised platform behind a half-height wall along the rear of the structure where tables and chairs could be placed, a dressing room for performers in the northwest corner near the stage and an exit door. A small alcove extended out the west side wall of the structure, suitable for use by a drummer during concerts. On the east side of the structure were the main bar that had an exit door, a small kitchen with an exit door, a dart room where video games were available, and office and storage areas. Toward the back (south side), in a direct line with the main

door, were the restrooms and a bar that was used when the club was busy. There was no exit along the back (south) wall of the building.

The main entrance to the building was located in the front (north side), slightly offset from the middle of the building. Double doors opened into a small entry way which then led into another small space the opened into the main bar on the left and into the performance space on the right. A ticket counter was located in the back corner of this entry way.

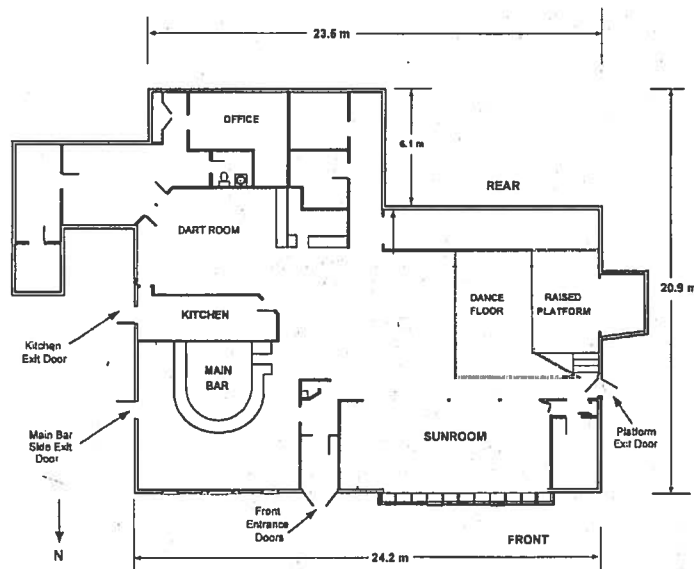


Fig. 1. Floor plan of club, adapted from [3]

The locations and visibility of the four exits in the building are important to note. The stage door was at least partially screened the night of the fire by a large speaker. The setup created a sort of hallway for performers to pass through between the dressing room and the stage. The door in the kitchen was only visible to people in the kitchen, or to anyone looking through the food pass-through window located in the circulation area behind the front entryway. The door in the main bar was visible as was the main entrance door. There were illuminated exit signs above each exit. In the video taken on the night of the fire, it does not appear that the exit sign over the stage door was lit [4].

On the evening of this concert, the pool tables had been moved against the windows at the front of the building and the tables and chairs throughout the club had been taken outside, to free up floor space for the large crowd that was expected for the headline band.

The building had no automatic suppression equipment. There was a fire alarm system present in the building and it did operate.

Expanded foam insulating material had been applied as sound-deadening material to the walls and ceiling around the stage area and into the alcove at the back of the stage. The composition of the foam is not known.

FIRE DESCRIPTION

At 11:07 p.m., as the main act was taking the stage, an array of pyrotechnic devices was set off. Under the low ceiling above the stage, the pyrotechnics ignited the foam in the drummer's alcove that extended out from the back of the stage (extreme right-hand side of the building). Within seconds the fire began to spread across the ceiling. In a matter of 5 minutes and 23 seconds, the fire spread from the stage wall to the main entrance and front windows. A timeline for the incident was extracted from the video footage taken by the news station videographer and published in the NFPA investigation report. It is shown in Table 1.

METHODOLOGY FOR THIS STUDY

Ideally, a study of behavior in emergency evacuations is done using a questionnaire or interview specifically designed for that incident and applied consistently with all respondents. When that is not possible, other sources can be used. For example, media accounts were used to study the evacuation of the World Trade Center in 2001 [2]. Police interviews were used successfully to study occupant behavior in the Beverly Hills Supper Club in 1977 [1]. Although witness statements do not provide the scientific rigor of a survey-based project, the detail in the statements can provide important insights into the experiences, reactions and decisions of the survivors.

Table 1. Sequence of Events in Station Nightclub Fire as Shown in WPRI-TV Video [3].

| Elapsed Time | Event | Elapsed Time | Event |
|--------------|---|--------------|--|
| 0:00 | Pyrotechnics activated | 1:53 | Black smoke at front door - occupants piled at door |
| 0:09 | Flame visible on wall | 2:00 | Alarms no longer audible from the outside of the building |
| 0:19 | Flames progressing upward - crowd begins to react | 2:23 | Occupants exiting at windows near bar (left of front exit) |
| 0:25 | Flames at ceiling | 3:00 | Black smoke at all front openings (windows and doors) |
| 0:35 | Band stops playing | 3:25 | Black smoke fills entire front door (victims still piled at door) |
| 0:48 | Alarms heard | 4:00 | Black smoke thickening at all front openings |
| 1:00 | Smoke at ceiling throughout room | 4:30 | Sirens audible in background |
| 1:15 | Cameraman at front door (smoke at ceiling and out front door) | 4:30-4:45 | View of platform door -- fire on floor, heavy black smoke, and dripping materials from ceiling |
| 1:30 | Fire visible at platform door | 5:00 | Fire visible at restroom wing |
| 1:43 | Black smoke at bottom of sunroom windows | 5:23 | Flames at front openings (doors and windows) |

Data Source

Over the course of several weeks following the incident, local and state police investigators compiled almost 400 witness statements, primarily from occupants of the building or on the premises at the time of the fire. In all, 355 people who were present inside the building at the time of the fire provided witness statements that were used in this study. These witness statements took several forms and more than one type of statement was available for almost half of the witnesses. Almost all of the cases included notes that were taken by the investigators while interviewing the witnesses (317 cases). Many witnesses provided handwritten statements providing details of their experience that evening (114 cases). Transcripts of some of the interviews were available (71 cases). A questionnaire was used in the interviews of 28 of the witnesses. The questionnaire asked when the individual arrived, who he or she was with or met there, whether or not they saw the pyrotechnics set up, where they were situated when the fire started, which exit they used, whether they were injured, whether they had been to the Station before, whether they had seen pyrotechnics used there before, whether they had noticed anything unusual or knew anything about the installation of the foam, and any comments about the crowd, tables or windows. These questionnaires appeared to have been filled out by investigators, not by the individuals themselves.

In addition, 38 of the occupants presented testimony to the grand jury that was assembled to deliberate criminal charges in the incident.

Data Extraction

The authors followed a content analysis methodology similar to that used in studying media accounts of occupant evacuations from the World Trade Center in 2001 [2]. To analyze the witness statements, a "questionnaire" was developed and used to "interview" each statement. Data of interest in the statements included the person's familiarity with the club, their time of arrival, their recollection of the sequence of

events and their own actions, their observations of the actions and reactions of others, their escape route, injuries (if any), intoxication (if any), as well as demographic details. Based on the responses received, a coding scheme was devised, the accounts were coded and the coded responses were analyzed.

Each witness statement was reviewed by two of the co-authors, who entered the data into an Excel spreadsheet. The two spreadsheets were then compared, and a composite matrix was developed from the two reviews. Any discrepancies were resolved by a re-reading of the statements. The 38 transcripts of grand jury testimony were evaluated, and details available from that testimony were added to the matrix. In some cases, information on individuals was obtained from the statements of accompanying witnesses. For example, a police statement might mention that a person reported the same sequence of events as his or her spouse or friend, and so that information would be used for both people. In other cases, groups of friends reported the actions of the group and those details could be used for all involved. In a few cases, newsclips were included in the witness statements, providing additional detail for the witness. In addition, interviews in newspapers and other media were checked for supplemental details.

Limitations

One important limitation to this methodology is that the data was obtained for another purpose, and a consistent set of questions was not presented to each respondent. There were several investigators conducting the interviews and many witnesses were interviewed more than once over a period of several months. To a great degree, the police were looking for information about the ignition of the pyrotechnic devices and issues about permission for use of such devices at that venue, and often they did not ask additional questions once they received the information they sought or ascertained that the respondent did not have information that they needed.

ANALYSIS RESULTS

Description of the Population

The 355 survivors who provided witness statements included 245 men and 110 women who ranged in age from 19 to 57, with a median age of 32. Age was not reported for 51 of the survivors. The distribution by age is shown in Figure 2. The solid line on the graph represents the age distribution of the survivors. The dashed line on the graph is shown for comparison and represents the age distribution of the 66 men and 34 women who died in the fire.

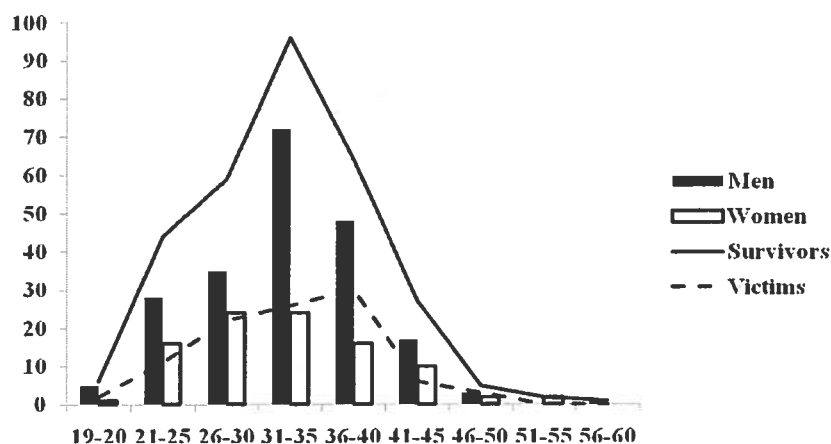


Fig. 2. Age distribution of victims and survivors (N=304)

Most of the survivors were patrons of the club (325 of the 355). Eleven of the survivors were members of the touring bands performing that evening or were in some way associated with the bands (e.g., managers, sound engineer, promoter, video producer). Ten were members of staff, including one of the owners. Six were employees of a radio station and beer distributor who were conducting promotions at the club that night. The other survivors included two police officers working a security detail at the club and a television

news videographer who was filming footage for an upcoming news story on nightclub safety. (Four employees died in the fire.)

None of the witness statements indicated that any of the survivors had any disability.

Very little information about training was available, except for members of staff, who were specifically asked if they had received any training. Although the club manager mentioned that fire suppression and evacuation were discussed with the staff responsible for security, five staff members said they had received no training on emergency procedures or evacuation (including one of the bouncers). One staff person mentioned receiving advice from his father recommending the use of the kitchen exit in an emergency because few others would know it existed. The only four customers who mentioned training were two nurses, a firefighter and the son of a firefighter, whose father had suggested using an exit not used by others. One of the nurses mentioned staying low under smoke. None of the people in or associated with the touring bands mentioned anything about training.

Familiarity

Past research has shown that people will tend to move toward the 'familiar' in an emergency evacuation, attempting to reach people or exits that they know [5]. In order to gauge the potential for that effect in this fire, the witness statements were examined to see whether patrons came alone or with others and how familiar they were with the structure and its exits. As would be expected, all of the patrons entered the Station through the front (main) door, where tickets were collected and hands were stamped.

Alone or with Others

Of the 325 patrons, 275 went to the club that night with at least one other person. Forty-five came alone, and of those 45, 28 met people there or knew people there. Seventeen apparently remained on their own during the evening, and one survivor who arrived with a friend was alone because his friend left before the main performance started. It was difficult to determine how many occupant groupings did not remain intact by the time the concert began. Some occupants mentioned in their witness statements that a friend or friend moved closer to the stage, for example, or had gone to the bar for a drink, but reporting on that was very incomplete.

Previous Visits to the Station

It might be assumed that people who visited the club more often would be more familiar with available exits. Information on frequency of attendance at the club was available for 288 of the surviving patrons. Almost a third of those patrons were in the club for the first time (84 survivors or 29.2 percent). Another 10.8 percent (31 survivors) were there for the second time. Sixty-two others had been there three to five times before, or said they had been there 'a few' times. Taken together, these three groups accounted for just over 60 percent of the patrons in the club that night. At least two dozen patrons indicated that they were at the club regularly. Eight of these patrons at times played different roles at the club. Four of them helped out around the club or provided security, when asked. Two were members of a band that played there regularly, and that was the opening act for the two touring bands earlier that evening. Two were asked to help sell band merchandise that night.

Awareness of Exits before the Fire

Some information about awareness of exits was available for 82 of the patrons. Thirty-two indicated that they were aware of all or most of the alternate exits, with some mentioning it was because they were there so often, and one because their party made a point of familiarizing themselves with the exits. Twenty-four were not aware of the location of the alternate exits. Fourteen were aware of the exit door near the stage. Ten were aware of the exit in the main bar, as well as the front door. Two were aware of the kitchen exit. Of those who were in the club for the first time, eight were not aware of the location of exits, three were aware of the stage door (two of them because they were standing right there), three were aware of the door in the main bar, and one person was aware of both of those alternative exits. No information about awareness of exits was mentioned for any of the other first-time patrons.

Noticed Exit Signs before Fire

The witness statements were examined for any mention of exit signs that were noticed before the fire. Twenty-five of the survivors explicitly stated that they did not notice any exit signs. Although one person

stated that there was no sign at the stage exit door indicating that one could use it, six others did notice an unlit exit sign at the stage door. Two noticed the exit sign at the main door, and two noticed a lit exit sign in the main bar. Three mentioned a lit exit sign near the rear bar, but they did not say where that sign directed them.

Arrival Time at the Station

The members of the touring bands, Great White and Tripp, and their entourage arrived for load-in during the afternoon and then were in and out of the club until the evening, either doing errands or waiting on the tour bus parked outside the venue.

Members of staff arrived throughout the afternoon and early evening, with the manager and sound technician arriving earliest and most of the bartenders and wait staff arriving after 7:00 pm. The owner was there at 8:30 pm.

The radio station and beer company staff who were there doing promotions arrived between 9:00 pm and 10:30 pm. The two police officers arrived at 9:00 pm and 10:30 pm, respectively.

The television station videographer arrived after 10:30 pm.

Arrival time was available for 297 of the 325 surviving patrons. As shown in Fig. 3, more than half of them arrived at the Station after 9:30 p.m., 90 minutes before the fire occurred. Approximately 20 percent arrived within 30 minutes of the start of the concert. Familiarity with the venue could be determined for all but one of the 56 people who arrived after 10:30 p.m. Ten of them were there for the first time; another seven were there for only the second time. None of them reported being aware of any of the alternative exits.

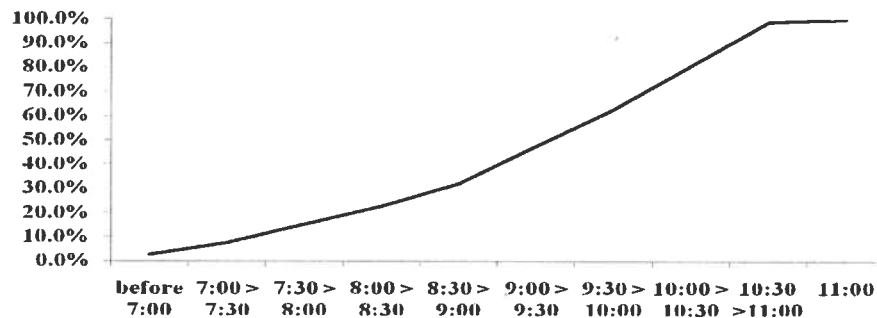


Fig. 3. Arrival Time of Patrons (N=297)

Conditions in the Station Before the Fire

Intoxication

Information on occupant condition was rarely reported. It was apparently not a factor in the police investigation, since only a few people were specifically asked about drinking, and fewer volunteered the information. What little is available was usually reported by people who mentioned purchasing drinks at the bar, but in only a few cases did anyone mention their physical condition.

Fifty-six survivors mentioned consuming alcohol. Five of them specifically stated that they were not drunk. Two women reported that they were intoxicated. Twenty people said they were not drinking alcohol that evening.

Although one person reported that the crowd was very intoxicated that evening, others reported moderate drinking, with one saying that he thought that most people had had a couple of drinks "to enjoy the night." The few comments describing the crowd in the club that night reported a friendly, relaxed atmosphere, not rowdy, well-behaved, happy and into the music.

Crowdedness

Although the official legal capacity of the Station on the night of the fire is not clear, the NIST investigation report cites an unsigned fire department memorandum from 2000 that allowed an occupancy of 404 if all tables and chairs were removed [6]. With the 355 witnesses interviewed by the police and the

100 victims, the estimated crowd the night of the fire was at least 455. The witness statements were reviewed for the survivors' perception of the crowdedness of the venue at the time of the fire. There were descriptions of crowd size or crowdedness available for 182 of the survivors. These descriptions are qualitative and it is not possible to quantify the degrees of crowdedness that were observed but the comments can be summarized. Fifty people did describe uncomfortably crowded conditions. Thirty-two described crowded conditions, but noted that they were not excessively or uncomfortably crowded. These observations are subjective, of course, and what was not considered excessive or uncomfortable for one person might be described very differently by someone else. Others described a crowded situation, but many noted that conditions were most crowded close to the stage, and that it was easier to move around in the main bar and around the sound board. Only three people indicated that the club was not crowded.

Location at Start of the Fire

Figure 4 shows the floor plan of the Station subdivided into smaller areas that correspond to the locations at the start of the fire, as described in the witness statements. The small asterisk near the center of the venue represents the soundboard, which was a reference point for many of the survivors. Location at ignition was described for all but 14 of the survivors. Another eight described where they were, but not in enough detail to place them on the floor plan. (For example, two said they were 'near the bar' but did not specify which bar, and no other details in their statements clarified that point.) The defined locations as marked on the maps are approximations, and cannot validly be used to calculate crowd density, although the location descriptions do support the characterization of crowdedness discussed above.

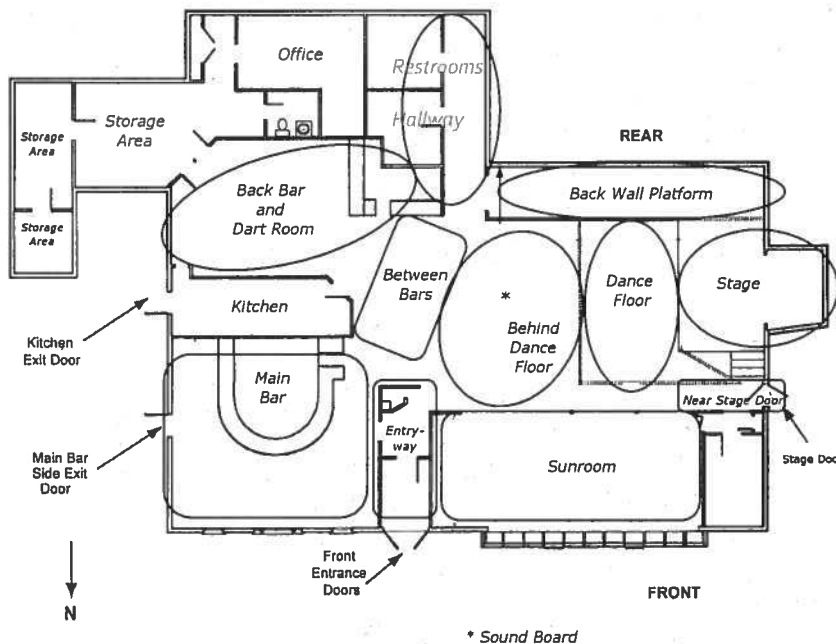


Fig. 4. Floor plan of club, showing approximate locations at ignition.

Seventy-five survivors said they were close to the stage or on the dance floor, and another 74 were located near or at the soundboard or behind the dance floor. Seventeen were near the stage door, 16 were in the sunroom and 15 were along the back wall behind a half-height wall. (A few people described this area as being a step up from the main floor level.) Seven people were somewhere in the center of the space, between the sunroom and the soundboard. Together with the four members of the band on the stage, this places 208 of the survivors in the spaces to the right of the entrance way, extending to the back of the structure.

Seventy-one people were in the area approximately in the center and back of the structure -- at the rear bar and dart room, in the hallway leading to the restrooms or in the restrooms.

Thirty-seven people were in the main bar, with six of them mentioning that they were close to the emergency exit in the main bar. Seventeen people were in or close to the entranceway.

Response and Reaction to Cues

Awareness of Fire

The fire began when the main act band opened their show with a pyrotechnic display that ignited combustible foam material on the walls and ceiling surrounding the stage area. Since the attention of the crowd was on the performance, it is not surprising that the vast majority of the survivors were aware of the fire immediately (248 of the 277 who mentioned the conditions or circumstances under which they first became aware of the fire). Thirteen people, many of whom said they had their back to the stage, first became aware of the fire because of the resulting commotion or reaction of others, e.g., being pushed by the crowd, seeing the staff respond. Eight people were told by friends or heard someone mention that there was a fire. Three felt the heat of the fire on their backs. Two people noticed that the music had stopped, and looked toward the stage and saw the fire.

Perception of Seriousness

When the pyrotechnic display ended and the sparks subsided, it became apparent that the foam material around the stage had caught fire. Of the 191 witness statements that gave an indication of the survivors' recognition of what was happening, 103 in some way clearly viewed the situation as serious, with 58 of the 103 deciding right away that they needed to evacuate, 32 stating that the situation was not good or not part of the show, eight heeding their friend's or partner's insistence on leaving and five running for fire extinguishers or radioing the fire department. On the other hand, 80 of the survivors indicated that they thought the fire was part of the act, that someone would put the fire out or that the fire would self-extinguish or that it wasn't too bad or out of control. Another five watched and waited to see what would happen and three described themselves as mesmerized or 'in awe.'

Firefighting

Within seconds, it became apparent to everyone that the fire was spreading rapidly. Four employees, three people associated with the bands and a customer who often helped out at the club attempted to fight the fire. One of the employees retrieved the extinguisher at the soundboard but did not use it because the fire had grown too large. Another went to the front door to get the extinguisher stored there, but could not get back through the crowd and dropped the extinguisher by the door. One of the bouncers working near the stage ran into the dressing room to get some bottled water to fight the fire, then realized it would be ineffective and dropped the bottles. Another bouncer went to the kitchen for a fire extinguisher but by the time he got back as far as the soundboard, the fire was too large. The manager of one of the bands grabbed water to put out the fire and then went, unsuccessfully, to look for an extinguisher. The manager of the other band headed toward the stage to reach a fire extinguisher, but then decided that security staff there would have already retrieved any that were near the stage and he was then blocked by the crowd when he tried to reach an extinguisher up near the front door. A member of the band threw water from his water bottle on the fire in its early stages. The occasional employee of the club tried to reach the extinguisher at the main entrance but could not get through the crowd.

Gathering Possessions

Very few of the survivors mentioned gathering their belongings before evacuating. This could be due in large part to the nature of the venue, where the patrons were standing in a crowd and were likely to have any coats or purses with them. It is interesting to note that one of the bartenders took the cash register and tip jar with her as she left. A server hid her tray of drinks in the kitchen before leaving. A customer helping at the bands' merchandise table took a box of CDs with her, thinking that would help her get past the bouncer at the stage door. Band members took their instruments.

Finding Others

As mentioned earlier, movement toward the familiar is a behavior often observed in emergency evacuations. Although it was difficult to determine which social groups had separated before the fire

started, the witness statements were examined to find survivors who reported gathering or not with the friends and family with whom they attended the concert. Of the 275 customers who attended with other people, 124 were with their party and did not need to gather their group before evacuating. Sixteen did not try to find members of their group. Five did try to find members of their party before leaving. Eight tried to find some, but not all, members of their group. No such detail could be determined from the other 122 survivor accounts of patrons. All of the members of the radio station promotions teams mentioned that they gathered as a group before evacuating.

The Evacuation

Twenty-one people mentioned that they alerted other people that there was a fire, while three mentioned that they were notified by someone else. Twelve people reported that they were directed to an exit, and five people reported directing others to an exit. The bartender at the rear bar told people around the bar to follow her as she led them to the kitchen exit. Her actions were reported in several of the witness statements.

Given that smoke was at the ceiling level in the stage side of the club within one minute, it is not surprising that 130 of the survivors mentioned that they moved through smoke during their evacuation, although nine reported that they did not move through smoke.

Many people reported difficulties during their evacuation. In their witness statements, 169 survivors mentioned obstructions in their evacuation. Most of those people (130) mentioned crowdedness or the other people as a problem in their evacuation. This includes 31 people who said they were caught in the pile-up at the front door and had to be assisted out, and one person who said he jumped over people caught in the doorway. Sixty-four mentioned that the smoke caused difficulties with seeing the exits, finding their way or breathing. Nineteen people mentioned darkness or being unable to see, but some of them may have been referring to the smoke. Thirteen people said that they broke windows, and another three mentioned that they had trouble breaking a window, without indicating if they were ultimately successful.

Thirteen people mentioned that a bouncer blocked access to the stage door exit. Some of them passed that way anyway, but others changed direction and attempted to leave by the main door instead.

Due to either crowdedness or smoke, 74 people reported that they were on the ground at some point during the evacuation, having either fallen or been knocked down, or dropping down to breathe more easily. Twenty-two people mentioned that they had to crawl to escape. Eight covered their faces to block the smoke.

Forty-four people said they were pushed by the crowd and 14 said that they pushed through or past others in order to leave. Of the 63 people who reported that they began their evacuation with another person, 21 eventually became separated from that person.

Although the building fire alarms can be clearly heard on the videotape of the incident 48 seconds after the pyrotechnics went off, 23 people said they did not hear the alarms. (Since it was not possible to determine how long it took people to evacuate, this could include a few people who were already outside before the alarms went off.)

Altruistic behavior during evacuations has been reported frequently [7] and even though the evacuation in this incident was extremely brief, there were many reported incidences of helping behavior. People reported being directed to exits, as mentioned above. People who fell to the floor and were trampled mentioned being helped to their feet. Survivors were helped out windows by others still inside, who might not have been able to save themselves, given the rapid spread of fire. Others were directed to doors and windows by people outside who called and reached in to them, risking injury to themselves.

Exit Choice and Travel Paths

The tendency of building occupants to try to leave by the main entrance has been well-documented in other emergency incidents [8]. This was also the case in the evacuation of this venue. Exit usage could be determined for 347 of the 355 survivors. Of those 347, 127 exited via the front or main entrance. From the witness statements it was possible to determine that at least another 62 people attempted to use the main door, but were not able to do so. Thirty-four of the 62 people with failed attempts at using the main door exited through a window instead. Twenty-five exited through another door. In all then, at least 50 percent

of the survivors of the club tried to use or succeeding in using the front door.

Several of the people who headed to the main door reported that they were pushed by the crowd past the doorway that led into the front entranceway and ended up in the main bar area. Some were able to access the entranceway from the doorway in the main bar area, while most others had to seek other exits.

Using the areas marked on Figure 4 that described locations at ignition, Table 2 shows the exits used by the occupants, by starting location. The exits were not always precisely described; 22 survivors mentioned leaving via a door or window, but did not describe its location. In two cases, the survivors mentioned the side of the building from which they escaped, but it could not be determined if they used a door or window.

The people closest to exit doors almost always used those doors. For example, the 17 people in or near the entranceway, the six people near the door in the main bar area and the four people on stage used the front, main bar and stage doors, respectively. Of the other 31 people in the main bar area, 18 used the exit door there and eight used the front door, which could be reached from that side of the building through a door into the entranceway. Two others used windows in the main bar area and three used an unspecified window or door.

Of the 15 people along the back wall, 11 made their way into the main bar area (seven going out a window and four using the door), three went out the front door and one used the kitchen exit.

Ten of the 17 people near the stage door used that exit, but three used the front door and one each went out the main bar and sunroom windows. One used the kitchen exit and the other used an unspecified door. Two of the three who used the front door said that they were blocked from using the stage door by a bouncer. A family of four ignored the bouncer blocking access to the stage door and exited that way anyway. The person who used the kitchen door was a staff member.

Only four of the 16 people in the sunroom were able to reach the front door. Six went out the windows in that space and three went out an unspecified window. Two went out the stage door together. One person travelled across the building to exit out the main bar door.

Of the 28 people at or near the rear bar and dart room, 10 used the main bar door, 10 used the kitchen exit, four went out the front door, three went out a window in the main bar and one went out an unspecified window.

For the people in the back hallway or in the restrooms, the closest exits would have been the kitchen door and the front door. But of the 14 people in the area, only three went out through the kitchen and three out the front door. Three others went out the main bar door, two used a window in the sunroom, one used a main bar window and one used an unspecified window. No exit was determined for one person.

As indicated above, the most crowded space in the building was close to the stage. The people in that area were the closest to the fire and dealt with the most immediate and severe obstructions to evacuation. Interestingly, of the 75 near the stage or on the dance floor, only 16 were able to go out the front door, and seven used the stage door – the two closest exits. The largest share (32 people) went out to the main bar area, with 28 exiting out windows and four using the emergency exit in the main bar. Twelve others escaped out the windows in the sunroom. One went out the kitchen door. The other seven used unspecified doors or windows.

The people behind the dance floor and around the soundboard were most likely to use the front door, their closest exit (40 out of 74). Twenty-six others went out through the main bar, with 15 using that door and 11 going out windows. Three people used windows in the sunroom and one used the kitchen door. The other four used an unspecified door or window.

Of the 29 people who described their location at ignition as the area between the two bars, 15 used the front door, nine used the main bar door, two used a window in the main bar, two used an unspecified door or window and one did not mention the exit used.

There were seven other people who described being in an area somewhere in the middle of the space on the stage side of the building. Four left by the front door, one by the bar door, one by the kitchen door and one out a window in the main bar.

Ten of the 22 survivors for whom there location at ignition could not be determined left by the front door,

two used a window in the sunroom, one used a window in the main bar, one used the kitchen door, two used unspecified windows and six did not say how they exited the building.

Overall, it appears from the witness statements that 35.8 percent of the survivors left via the front door, 20.0 via the main bar door, 5.4 percent via the kitchen door and 6.5 percent via the stage door. Another 27.9 percent escaped out a window – 16.1 percent through a window in the main bar, 7.3 percent through a window in the sunroom and 4.5 percent through an unspecified window. More than a third of the people on the dance floor or near the stage travelled across the venue to escape through a window in the main bar (37.3 percent) and another 5.3 percent used the exit door in that area. Only 12.6 percent of those on the dance floor or near the stage were able to use the front door. The largest proportion of people who used the front door started from the area behind the dance floor (31.5 percent).

It is interesting to note the locations of the 96 victims who died at the scene [9]. The largest number were concentrated in the entranceway, where the pileup at the door occurred (31 deaths), and another nine were in the area behind the dance floor, near the doorway into the entranceway. There were 23 victims found in the dart room, storage area and offices. Eighteen were found in the sunroom along the wall adjoining the entranceway. Three victims were found in the main bar. Three victims were found in the restrooms, one in the kitchen and one on the dance floor. Seven were found outside the sunroom.

Post-Evacuation

Six people said they re-entered the building after getting out. Two of them were working together to try to rescue people from the main bar area. One said he re-entered the kitchen, moving approximately 2.5 meters into the building, to help someone out. One described himself as going in and out of the stage door exit in the process of assisting people out that door. One said re-entered the stage door exit after retrieving a fire extinguisher from the band's tour bus, but left again immediately. One was a customer who had gotten out the front door when he realized his friend was caught in the inner door of the entryway, and pushed his way back to help him out. Three other people tried to re-enter but were unable to do so because of the worsening fire conditions.

After they were out of the building, 62 people said that they looked for their friends or family members in the parking lot or at the triage area set up across the street. Forty-one people said they helped or tried to help people from windows or from the pile-up at the front door. Thirty people went to the hospital, either for treatment for themselves or transporting friends. Twenty-five people assisted injured people, by putting snow on their burns, helping them to the triage area or to waiting ambulances or assisting at the triage area. Nine people mentioned calling family or friends. Seven called 911 and two approached a police car that was parked at the scene to report the fire. Three people mentioned moving their vehicles so that the fire department would have better access.

Some information about injuries was available for 306 of the survivors. Of those 306, 96 were not injured. Another five people received their injuries after they got out of the building, while they were attempting to rescue people still trapped inside. Privacy protections limit the amount of information that could be reported in the witness statements when they were made available to the public, so the nature and extent of injuries was often not shown. In order of injury severity and with the available information noted, 26 were hospitalized in intensive care units or were reported as critically or severely injured; 11 suffered life-threatening burns; 24 were hospitalized with burns or smoke inhalation or unreported injury; five received moderate injuries; 36 had minor or slight injuries, mostly cuts, scratches, bruises and a few burns; 40 were treated and released at hospitals; 17 sought medical treatment in the next day or so; and the other 46 injuries were not categorized as to their severity.

CONCLUDING REMARKS

The events in this fire unfolded in an extraordinarily short period of time for the more than 400 occupants in this small structure. According to NIST's analysis of the fire, untenable conditions were reached on the dance floor in less than 90 seconds, and in the dart room and sunroom areas 10 seconds later. A more tenable condition was contained near the front door and in the main bar because of the open doors and broken windows [10], but as shown on the video, black smoke filled all the doors and windows within three minutes.

Although it was not possible to conduct a survey or interview evacuation study for this incident, the witness accounts provided by police investigators answered many questions about the location and escape paths of the survivors, and documented many of the actions and reaction during the course of the evacuation.

As a result of this incident and a crowd crush incident that had occurred in Chicago three days earlier, code changes were made regarding fire sprinklers in nightclubs and other assembly occupancies that accommodate more than 100 people, inspection of exits to ensure that they are free of obstructions, trained crowd managers at venues. Subsequently, additional code changes were made to increase the exit capacity of main exits of assembly occupancies from one-half to two-thirds of the total occupant load. Interior finish requirements for all occupancies were also addressed.

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Table 2. Exit used by location at ignition for all survivors.

| Area at Ignition | Sunroom window | Bar door | Unspecfd door | Front Door | Kitchen | Main bar window | Window or door (right) | Window or door (left) | Stage | Unspecfd window | Unk | Total |
|------------------------------|----------------|-----------|---------------|------------|-----------|-----------------|------------------------|-----------------------|-----------|-----------------|----------|------------|
| Unclear | | | | 6 | | | | | | 1 | 1 | 8 |
| Stage | | | | | | | | | 4 | | | 4 |
| Near stage door | 1 | | 1 | 3 | 1 | 1 | | | 10 | | | 17 |
| Near stage or on dance floor | 12 | 4 | 1 | 16 | 1 | 28 | 1 | | 7 | 5 | | 75 |
| Back wall platform | | 4 | | 3 | 1 | 7 | | | | | | 15 |
| Sunroom | 6 | 1 | | 4 | | | | | 2 | 3 | | 16 |
| Behind dance floor | 3 | 15 | 1 | 40 | 1 | 11 | | | | 3 | | 74 |
| Back hallway | 2 | 3 | | 3 | 3 | 1 | | | | 1 | 1 | 14 |
| Between bars | | 9 | 1 | 15 | | 2 | | 1 | | | 1 | 29 |
| Rear bar/Dart room | | 10 | | 4 | 10 | 3 | | | | 1 | | 28 |
| Entryway | | | | 17 | | | | | | | | 17 |
| Main bar | | 24 | 2 | 8 | | 2 | | | | 1 | | 37 |
| Center stage-side | | 1 | | 4 | 1 | 1 | | | | | | 7 |
| Unknown/not rptd | 2 | | | 4 | 1 | 1 | | | | 1 | 5 | 14 |
| Total | 26 | 71 | 6 | 127 | 19 | 57 | 1 | 1 | 23 | 16 | 8 | 355 |