

THE KISS NIGHTCLUB FIRE

This article updates my original fire report for the *Boate Kiss* tragedy, published in the Journal's [Spanish](#) and [Portuguese](#) editions in June 2013.



BY JAIME A. MONCADA, P.E.

At 03:15 am inside a nightclub crowded with college students, a band singer lights up a pyrotechnic flare, starting an inconceivable tragedy. The result, a disaster in which 242 people lost their lives and another 123 were seriously injured. According to the police report and multiple sources, 235 people perished in the fire and 7 more died in the hospital in the following days. This is the worst fire in the last 60 years in Brazil and the third worst in a nightclub worldwide.

Unfortunately, this fire is a replica of other recent nightclub tragedies that have occurred in the region. Fires with similar ingredients -- overcrowding, polyurethane sound insulation, pyrotechnics, and lack of sprinkler protection -- resulting in similarly dramatic outcomes (see list of recent nightclub fires in Latin America).

NIGHTCLUB FIRES IN LATIN AMERICA (2000-2023)				
NIGHTCLUB	CITY	COUNTRY	DATE	DEATHS
Boate Kiss	Santa Maria	Brazil	27-Jan-13	242
Disco Factory	Quito	Ecuador	19-Apr-08	19
Disco Cromañón	Buenos Aires	Argentina	30-Dec-04	194
Club La Guajira	Caracas	Venezuela	1-Dec-02	47
Disco Utopia	Lima	Peru	20-Jul-02	29
Disco Lobohombo	Mexico City	Mexico	21-Oct-00	22

List compiled by Jaime A. Moncada from published reports (Jan 26 2023)

This updated report on this fire is based on my visit to the fire scene, interviews with the investigators and firefighters who responded to the fire, my participation on the Discovery Channel special "Tragedy in Santa Maria" and support to the Associated Press while they reported on this incident, and my review of the police report of the incident and hundreds of photos and videos that were provided by the Santa Maria Fire Department and Rio Grande do Sul Civil Defense.

The Fire

In the college town of Santa Maria, at around 11:00 pm on Saturday, January 26, 2013, a nightclub, or *Boate*, as they are known in Brazil, called Kiss, opened its doors to mostly college students looking for an enjoyable time. The *Boate Kiss* was in the historic center of Santa Maria, a small city known also as “University City” due to its large student population. The city is in the State of Rio Grande do Sul, in southern Brazil, and although many of the city inhabitants have German or Italian ancestries, they identify themselves as “gauchos”, a nostalgic reference to rural ranchers.

That night, a party called “Agromerados” had been organized with the support from the school of agronomy from the Federal University of Santa Maria (UFSM). UFSM is the largest university in the state of Rio Grande do Sul, with approximately 25,000 students. One of the bands hired for this party was the *Gurizada Fandangueira*, a gaucho music group.

At about 02:00 am on Sunday, January 27, the *Boate* was completely full. Several of the survivors indicated that “one could walk” but had to ask permission to move forward. According to the final report by the Santa Maria Police published on March 22, 2013, it was estimated that at the time of the tragedy there were between 1,000 and 1,500 people in the various rooms of the disco. The television special “Tragedy in Santa Maria”, produced by the Discovery Channel, established that the occupant load of the *Boate* was 1,061 people and the maximum capacity allowed by the local fire code was 691 people. Because UFSM was on break that week, many of the local nightclubs closed their doors that night, but *Boate Kiss*, one of the popular clubs among the college students, opened that night.

At 03:00 am *Gurizada Fandangueira* began to play. Fifteen minutes later, a remote-controlled flare, which the band’s singer held in his left hand, protected by a glove, was ignited. The 7 cm (2-¾ inch) long artifact, commercially known as *Sputnik*, was designed for outdoor use. The singer moved his arm up and flare flames reached the expanded polyurethane foam that had been installed on the stage ceiling for soundproofing purposes.

As the fire became visible, the band stopped playing, and during this commotion a security employee, seeing the fire, tried to put it out with a nearby fire extinguisher. But the extinguisher did not work. It was later determined that the extinguisher was wrongfully used by partygoers, a couple of weeks earlier. At this point, the security employee described the fire as small, about 1 m (3 ft) in length. Occupants in front of the stage tried to help by throwing liquids onto the fire. When the security employee realized that he couldn’t put it out, the fire was already impacting almost the entire length of the stage; using the band's microphone, he ordered everyone to evacuate. However, his order was only heard by the people who were listening to the live concert, not by the hundreds of occupants in the other rooms of the club.

Those who witnessed the fire, as well as members of the band, hastily moved towards the front door. But there, they were held by two security guards, requesting to see bill payment confirmation before allowing them to leave. After their loud protestations, security allowed them to exit. However, by that time, a bottleneck had already formed at the only egress door. Unfortunately, many young people who were in other parts of the nightclub had not yet realized that there was a fire. Survivors mention that after two to three



minutes, the club was filled with smoke. During the first two minutes, electrical power was lost, and without illuminated exit signs or emergency lights, the nightclub went dark.

As gridlock formed at the main exit, some occupants decided to enter a restroom, practically adjacent to the main exit, thinking that they could exit from there. A few survivors mentioned that a green light emanated from the restroom, which possibly could have been confused with an exit sign. More than 100 people were found dead in the restrooms.

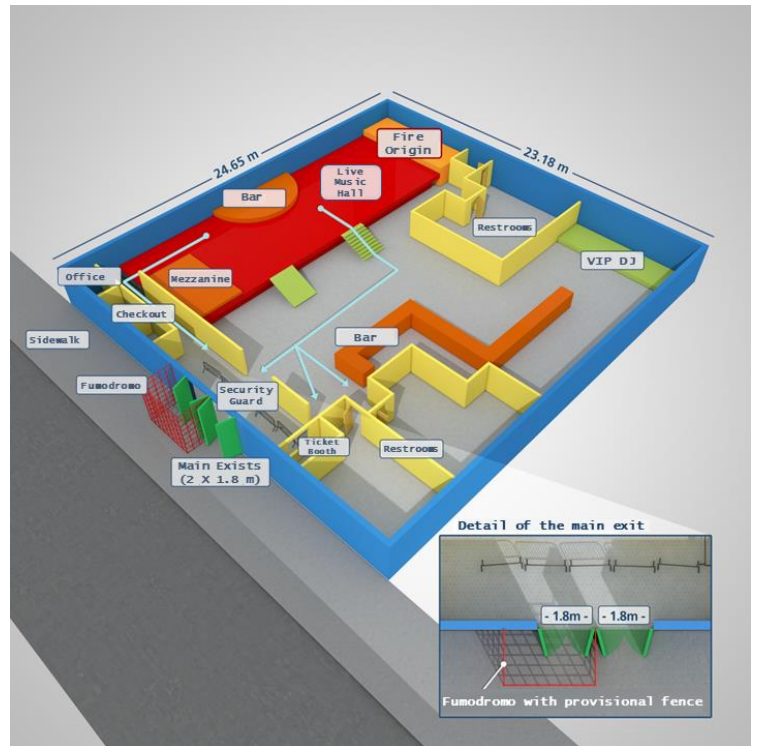
Immediately after calls were made to the Santa Maria Fire Service, at 03:17 am, a fire engine and a rescue unit, with a total of 10 firefighters was dispatched from Regional Fire Station #4, 2 km (1.25 miles) away from the *Boate Kiss*. Different sources estimated that between five and seven minutes later the firefighters were already in front of the building. When the firefighters entered the nightclub, they found the building filled with thick smoke. Some of them went looking for the seat of the fire and found that it had already self-extinguished. Others looked for survivors, but it was just too late for so many -- not because of a delayed fire department response, but rather due to the speed at which these types of fires develop and release extremely toxic gases. One of the most unexpected and haunting comments came from a responding firefighter, who told me that when he entered the building, hundreds of cell phones were ceaselessly ringing and vibrating -- repeated calls from parents and loved ones as word of the fire spread, and from friends who had made it out, worried about those still trapped inside. At approximately 04:00 am, human remains recovery began.

The Building

The *Boate Kiss* building was a one-story structure, built on a lot surrounded by buildings on three of its sides, with a façade on Rua do Andradas, a two-lane street. In the center of the façade, two sets of exits, each with double doors, were installed side by side, with a total width of 360 cm. These doors were the only exits. The doors opened to the outside and had panic hardware. According to the egress regulations of the state of Rio Grande do Sul, these doors limited the building's capacity to 691 people. Although the two double doors provided a single exit to the outside, one of these double doors was fenced off with temporary metal grating, on the sidewalk side in front of the building, to allow partygoers to go out temporarily to smoke, but without being able to leave freely. This fenced area is referred to as a "fumódromo" in Brazil.

Also, it is important to understand how many nightclubs conduct business in Brazil. When you enter a nightclub, you receive a tab stub. Throughout the night, as you consume drinks or food, the stub is stamped with whatever you order. Before you can exit, you must present the tab stub to a checkout booth, your consumption is tallied, and you pay. Only when your tab stub is stamped as paid, can you freely leave the nightclub. This payment process is obviously counterproductive during an emergency, particularly in concentrated assembly occupancies, as was evidenced during this tragedy.

The building lot was a rectangle with a depth of 26.65 m (87½ ft) and a width of 23.18 m (76 ft), with a gross constructed area of 618 m² (6,649 ft²). In March 2010, after extensive renovation, the *Boate Kiss* had its inaugural opening. According to the construction documents approved by the municipality, the structure had brick exterior walls, a gabled metal roof, false ceilings of cardboard plaster, interior walls of plastered masonry covered with wood panels, and a ceramic floor.



The *boate* was only protected by fire extinguishers. There were no automatic sprinklers, hose cabinets, smoke detection and alarm systems, illuminated exit signs, or emergency lighting.

According to police reports, in late 2011, expanded polyurethane foam was installed to solve sound reverberation issues inside the nightclub. This foam was installed on the ceiling of the stage and on the walls of the checkout booths. According to police investigations, the polyurethane foam had not been treated with fire retardants.

Polyurethane foam is a highly combustible interior finish. When it undergoes pyrolysis, it releases hydrogen cyanide (HCN), also sometimes called prussic acid, which is a very rapidly acting toxicant. Hydrogen cyanide has a lethal dose 25 times smaller than that of carbon monoxide, the product of combustion most common in fires. Hydrogen cyanide is an asphyxiating gas that has a narcotic effect, inhibits respiration at the cellular level, and causes death by respiratory arrest. It is very lethal, just one exposure to 181 parts per million may be fatal in 10 minutes. Forensic studies found that HCN was the leading cause of death for the victims of this fire.

Another striking fact about this incident is the short duration of the actual fire, even though the building interior had combustible finishes and could have potentially undergone flashover. Pictures taken after the fire, around the VIP DJ area, just 15 m from the point of fire origin, show only smoke damage. Very likely this was a fuel rich fire, with not enough oxygen to support extended combustion outside the point of fire origin. The building appeared very airtight, with no windows, and only the front exit doors opened to the outside. Basically, the fire ran out of oxygen sufficient to cause the rest of the *Boate*'s combustible contents to ignite.



Contrast With The Station Nightclub Fire

The *Boate Kiss* fire has many similarities not only with the fire at the *Cromañón* nightclub, which occurred in Buenos Aires on December 30, 2004, where 194 people lost their lives, but also with the fire at The Station nightclub in Rhode Island, USA, where 100 people died in 2003. The Station fire occurred in a building that was about 30% smaller than the *Boate Kiss*. The importance of this fire is not only its similarity to the fire in Santa Maria, but that it was a widely documented and studied fire, which helps us better understand what may have happened at the *Boate Kiss*.

The Station fire had conditions very similar to those found at the *Boate Kiss*, including expanded polyurethane around the stage, where a rock band was also using pyrotechnics. This building, also a one floor structure, with a constructed area a little less than 500 m² (5,400 ft²) was not protected with automatic sprinklers. The building was, however, protected by a smoke detection and alarm system and four well-distributed egress doors. According to interviews with survivors, videos, and a full-scale laboratory fire test that replicated what happened in this incident, the adjacent dance floor to where the band was playing, filled with smoke in less than two minutes after ignition of the polyurethane, like what had been described at the *Boate Kiss*.

The Station fire, as mentioned above, was analyzed in a full-scale fire test by the National Institute of Standards and Technology (NIST), which later published, in June 2005, the Report of the Technical Investigation of The Station Nightclub Fire (NIST NCSTAR 2, Vol. 1). During these tests, it was found that 100 seconds after ignition, the conditions 8 m (26 ft) away from the stage where the fire started, and 1.4 m (4 ½ ft) above the floor, would have been lethal. It also found that if that same building had been protected with an automatic sprinkler system, most if not all the occupants of the nightclub would have survived the fire.

Measurement 100 sec After Ignition @ 1.4m Above Ground	NO SPRINKLERS	WITH SPRINKLERS ¹
Temperature (°C)	375°C	25°C
Oxygen Level (% of Volume)	3%	20.7%
Carbon Monoxide Level (% of Volume)	3%	0%
Hydrogen Cyanided Level (% of Volume)	0.13%	0%

1. Three sprinklers activate @ 23, 26, and 27 seconds after polyurethane ignition. Sprinklers are pendent, ordinary temperature, quick response, designed for light hazard per NFPA 13.

The Local Code

The local code in Santa Maria did not provide plan reviewers and fire inspectors with the tools to change the egress doors, remove polyurethane foam, or require the installation of automatic sprinklers. What has been reliably established is that the nightclub only had one functioning exit, and that it was overcrowded; that it did not have automatic sprinklers; and that the polyurethane foam used to attenuate the sound did not have fire retardants and was set on fire by pyrotechnics. With the exception of overcrowding, none of these conditions, even though they are contrary to what the NFPA codes and standards indicate, would have been valid violations in Rio Grande do Sul because local regulations did not require them to be different. In other words, in my view we cannot hold the municipal code enforcers responsible, because they did not have the tools to change the hazardous conditions in this place.

To offer an example of the problem of local regulations, the Technical Regulation for Fire Prevention of the State of Rio Grande do Sul (Decree No. 38.273 of March 9, 1998), regarding evacuation routes, references the Brazilian Association of Technical Standards ABNT 9077, Emergency Exits in Buildings. This standard, in its 35 pages, establishes in a simplistic way the design criteria for evacuation routes. Table 7 establishes that one floor *boates* (Group F6 occupancy, Code K), are required to have at least two egress routes. But nowhere in the standard is it defined that the two evacuation routes must be remote. NFPA 101 requires that the separation between two exits must be arranged to minimize the possibility that more than one exit has the potential to be blocked by one fire. During the design phase, an argument could have been made that the *Boate doors* complied with what the standard required since it had two independent exits, which was true, even if they were side by side. Because the standard is so simplistic and does not specify these types of critically important details, the inspector would not have had tools to change things, even though his experience may indicate that they are wrong.

After the opening of a property, fire inspections typically focus on the review of the firefighting systems and the evacuation exits. Generally, inspectors do not have the appropriate training to check interior finishes. In fact, a visual inspection of expanded polyurethane to verify if it is fire retardant is almost impossible. According to NFPA, polyurethane foam can be used in a nightclub if it is treated with a retardant and meets the criteria for a Class A finish.

In the last 10 years there have been a fair amount of fire code updates. Perhaps one of the most important improvements to date is that there is more standardization between jurisdictions. Brazil, from a legislation standpoint, is very similar to the US, where every state is free to adopt its own building and fire codes. New requirements on interior combustible finishes and pyrotechnics use have been adopted for nightclubs. However, issues with fire inspections and limited requirements for sprinkler protection continue to exist.

Acknowledgments

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