

HOSPITAL FIRE

St. Jerome, Quebec Canada

January 29, 1989



FIRE INVESTIGATIONS

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Summary Investigation Report

HOSPITAL FIRE ST. JEROME, QUEBEC, CANADA JANUARY 29, 1989

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INTRODUCTION

An early morning hospital fire in St. Jerome, Quebec, Canada, on January 29, 1989, resulted in the deaths of two emergency room patients and the total evacuation of the 300-bed hospital. Further, during the evacuation of the 275 patients, three critically ill patients died while being transferred to other area health facilities.

The fire occurred in the emergency room area located on the ground floor of the non-sprinklered hospital complex. The fire was discovered in an occupied isolation room and spread into the exit corridor when the patient was rescued from the room but the door was left open. The fire continued to spread through the exit corridor, fueled mainly by stored stretchers having polyurethane mattresses.

Smoke from the fire spread vertically through most of the remainder of the hospital by way of elevator shafts.

Upon their arrival, fire fighters from the St. Jerome Fire Department found a fire in progress and began advancing a 1 3/4-inch handline into the emergency room area. The fire fighters were able to control the fire in approximately 15 minutes; however, they discovered that smoke had spread throughout most of the remainder of the building. Fire fighters from mutual aid response assisted in the smoke removal and evacuation process.

The National Fire Protection Association conducted this summary fire investigation in cooperation with the St. Jerome Fire Department. Limitations of available data prevented more detailed reporting, and therefore, no attempt was made to compare the facts or conditions of this fire to state-of-the-art fire protection code requirements. The assistance and cooperation of Fire Chief Jacques Charbonneau, St. Jerome Fire Department, and Harold W. Nichol and Andrew K. Kim of the National Research Council, Canada, are greatly appreciated.

BACKGROUND

The village of St. Jerome is located approximately 18 miles north of Montreal. Many of the 25,000 residents are employed in light industry surrounding the village.

St. Jerome Hospital complex consisted of three separate buildings: a large 300-bed general care facility, a psychiatric hospital, and a maintenance building. The fire occurred in the general care building. The ground floor area was approximately 250 X 400-feet. The building was of varying height because of several expansions over the past 25 years. The original structure, built in the early 1960s, was a 7-story fire-resistive building to which 9-story, 5-story, and 2-story additions were added. Masonry fire walls and openings protected with fire doors were provided at various locations to segregate the building areas mostly at the union of building additions. Fire protection features contained within the facility varied from addition to addition, depending on the year in which it was constructed or on renovations. For example, renovations to the 7-story original structure

included a corridor smoke detection system that was connected to the building fire alarm system.

The fire occurred on the ground floor of the 2-story addition constructed in 1971. The addition was positioned on the east side of the building at the end of a circular approach driveway leading to the main entrance of the hospital. The addition was built around three exterior sides of the original structure. The ground floor area of the addition contained the emergency room and the cardiology and radiology units of the hospital. The functional areas on the floor were separated by gypsum wallboard on metal studs, and the individual unit areas were further divided by floor to finish ceiling partitions creating a network of office work areas.

An 8-foot wide exit corridor was positioned on the outer perimeter of the work areas and provided access to the various functional areas through cross corridors or doors opening directly into the work area. The gypsum wallboard corridor walls were covered with vinyl-type wall covering material, reportedly having a flame spread rating of 15 and smoke development rating of 35. A suspended metal grid with noncombustible lay-in tiles provided the finish ceiling system throughout the corridor and the majority of the emergency room area. Room doors opening onto the exit corridor were 1 3/4-inch solid wood doors. On the morning of the fire, most of the north-south portion and two-thirds of the east-west portion of the access corridor contained stretchers with polyurethane mattresses and bedding material stored along one of their walls.

The main entrance to the emergency room level was through automatic doors located at the emergency room/ambulance entrance. The entranceway led to the emergency room waiting area and the north-south exit corridor that led to the emergency room treatment rooms. Smoke barrier doors were positioned at various locations in this portion of the exit corridor. One set of doors was located near the waiting room area and adjacent to a security/fire control room. Another set of smoke barrier doors was positioned approximately 150 feet down the north-south portion of the corridor. Just after these doors, the corridor met an east-west portion that extended approximately 250 feet to an elevator lobby area providing access to

the original 7-story building. Just beyond the elevator lobby, fire doors were installed, separating the building at this point into separate fire areas.

The emergency room area of the hospital was not provided with complete automatic sprinkler protection, and there were no smoke detectors provided in corridors or treatment rooms. The HVAC system for the area was provided with a duct detector that was designed to shut down the HVAC system for the area. Activation of the smoke detector would provide a signal at an annunciator panel located at the guard's stations. A manual fire alarm system was provided for the area that also would result in a signal in the guard's room. The fire alarm system was designed with a pre-signal feature that would allow for the investigation of the source of the alarm before a "general alarm" sounded.

The fire originated in an isolation room approximately 150 feet from the emergency room entrance along the north-south corridor. Access to the 8 X 10-foot room was gained not only from the public corridor side but also from a nurses' (medical staff) area. The nurses' area was positioned parallel to the public corridor with several observation rooms sandwiched between the areas. This arrangement enabled the medical staff to move along a rear corridor and into treatment rooms for care. The medical area contained medical treatment materials and supplies stored in wooden cabinets or placed on counter space.

Both doors that provided access to the isolation room required a different key to operate them, and they could not be opened from within the room. The door on the public corridor side was a solid core door; the door from the medical area was of similar construction but had a 20-inch X 22-inch clear plastic window through which the staff could observe patients. Neither door was equipped with self-closers.

The isolation room contained a metal stretcher with a 4-inch thick polyurethane mattress, a cotton sheet, pillow, and blanket. Three walls of the room were constructed of gypsum wallboard walls on metal studs. Three walls had a vinyl wall covering finish; the fourth had 3/8-inch plywood material as its wall finish. The approximate 9-foot high finished

ceiling was of gypsum material. HVAC distribution equipment was provided to the room, and an approximately 6-inch X 8-inch return air grille was located in one of the walls near the tile floor.

FIRE INCIDENT

At approximately 12:30 a.m. on Sunday, January 29, 1989, an ambulance transported a 53-year-old male patient to the St. Jerome Hospital emergency room. Apparently because of his condition, he was placed in the isolation room.

Once the patient was placed in the room, a nurse reported observing him from the medical staff area at approximately 12:45 a.m. and noted nothing unusual. However, a short time later, she observed smoke coming from the room. She looked through the observation window and observed a fire within the room and the patient positioned at the far corner of the room. The nurse opened the door and attempted to rescue him, but she could not reach the patient because of the location of the fire (i.e., between her and the patient). She left the room, leaving the door open, and attempted to locate the on-call doctor who had the key to the other door.

Once the doctor was alerted, he proceeded to the isolation room, opened the door, and rescued the patient. In doing so, the door remained open. The doctor placed the patient approximately 75 feet from the room in the east-west corridor and then passed by the room of origin to notify the security guard of the fire. At this time, the flames from the fire were reported as extending from the room into the corridor approximately 7 feet. The security guard already was aware of the fire when the doctor reached the guard's desk. Apparently the HVAC system's duct detector or a manual pull station activated and a signal was received at the annunciator panel. The guard noted the time to be 1:03 a.m. After closing the smoke barrier doors near the waiting room area, the guard apparently attempted to extinguish the fire using a portable fire extinguisher but was discouraged in doing so by the doctor. Apparently, the guard then attempted to call the fire department but found that the telephone in the guard's room was not

working. He then went to the telephone operator's room and learned that she already had called the fire department.

The fire department received notification of the fire at 1:09 a.m., and six fire fighters responded with a pumper and rescue unit. Upon their arrival at 1:12 a.m. they found a "severe" fire in the emergency room area. Initially, three fire fighters began to advance a 1 3/4-inch handline into the emergency room. After approximately 5 minutes of suppression effort, the officer-in-charge requested mutual aid assistance from neighboring communities.

It was reported at approximately 1:25 a.m. that the fire fighters had controlled the fire, but they learned from the staff that the remainder of the hospital contained various amounts of smoke.

Shortly before the fire was controlled, hospital personnel began a total evacuation of the hospital (approximately 1:15 a.m.). Patients were moved primarily through three pressurized stairways in evacuating the building. At his arrival at approximately 1:30 a.m., the fire chief assumed command and coordinated the evacuation effort. The fire chief immediately ordered the recall of the remainder of his 25 fire fighters who were off duty that night. Fire fighters from the department and from the mutual aid response joined the 75 hospital employees in evacuating the hospital. Buses, taxis, and 60 ambulances from the neighboring communities were used to evacuate the 275 patients to other area medical facilities. The evacuation was completed at 2:30 a.m.

Fire damage to the emergency room area was extensive. The fire consumed most of the combustibles in the room of origin and spread to several adjacent observation rooms, also causing extensive damage. Since the doors to the room of fire origin were open, the medical area and the exit corridor also were severely damaged. The north-south corridor had extensive damage along its entire length, as did approximately half of the east-west corridor. Closed smoke doors at the north end on the north-south corridor were effective in preventing fire spread in this direction. Combustibles in the corridor area (mostly mattresses on stretchers totally

consumed) were destroyed or severely damaged, depending on their proximity to the room of origin. The fire did not extend from the corridor into adjacent rooms if the room doors were closed. Preliminary estimates of the fire damage has been placed at \$ 3 million.

Smoke spread in the emergency room area followed a path similar to the fire spread. However, there was some smoke spread into adjacent functional areas, most likely around doors that were closed and by way of HVAC systems open ducts. Smoke was able to move freely through over 400 feet of the exit corridor to the elevator lobby because a smoke barrier door (adjacent to the room of origin) was blocked open. Other smoke barrier doors in the area were closed and were effective.

In addition to the horizontal smoke migration, extensive amounts of smoke were able to move vertically to the upper floors of the building by way of the elevator shafts. It was most likely circulated about the floors by the HVAC system operation or through open ducts.

During the suppression effort, fire fighters located the patient from the isolation room in the east-west corridor. In addition to this victim, fire fighters located a 37-year-old victim in an observation room who was receiving emergency treatment following a skiing accident. In addition to these two fatalities, three critically ill patients died during the evacuation of the hospital, bringing the total number of fire deaths from this fire to five.

ANALYSIS

Local fire officials have concluded that the fire was set deliberately by the patient in the isolation room. The patient piled the bedding material in a corner of the room, one side of which was the 3/8-inch plywood finish wall. After the materials were ignited (most likely by a match), flames impinged on and ignited the plywood. Because of the physical arrangement of the fuels and their location within the room, the fire was able to spread along the exposed surface and corner of the plywood toward the ceiling. Because the nurse was not able to rescue the patient from the room due to the intensity of the fire, it is likely that the fire had reached the ceiling and was

spreading laterally along the ceiling, radiating to the combustibles below, at or shortly after the time of discovery. The fire continued to build in this manner while the nurse was attempting to locate the on-call doctor. Although products of combustion were spreading to the medical area and the fire was involving more surface area of the plywood, the fire likely did not significantly involve the medical area or the polyurethane mattress when the doctor reached the room. However, soon after the patient was removed and the door left open, the mattress likely became involved, driving the fire into the corridor and into the medical area. There was an abundant amount of combustibles in the medical area to sustain the rapidly spreading fire. Because of the access to observation rooms from this area, smoke and then fire, moved into and involved these adjacent rooms.

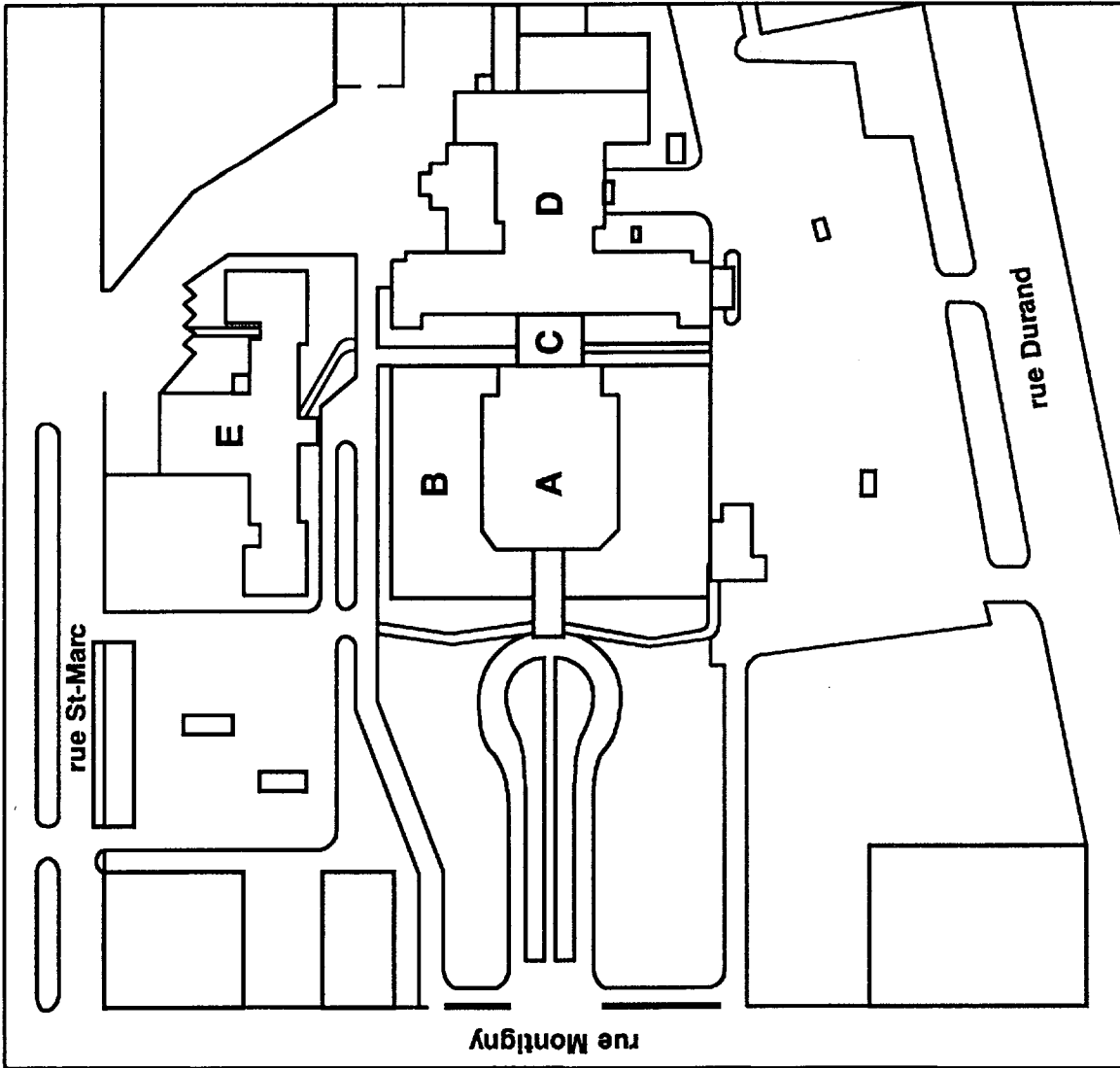
The significant flame extension into the exit corridor was of sufficient intensity to eventually involve the stored stretchers in the corridor. Once the several mattresses, immediately adjacent to the room of fire origin, became involved, the corridor fire was of sufficient magnitude to move in both directions down the corridor. The direction of fire extension likely was influenced by cool air (fresh air) supplying the area through the emergency room entrance doors. The fire, extending in this manner, was able to involve more and more of the stored stretchers until the fire involved over 400 feet of the exit corridor. Consumption of the available fuels in the corridor, the fire department's intervention, and closed fire doors just beyond the elevators prevented the further spread of fire. However, these variables did not prevent smoke from spreading through the elevator shafts and onto patient floors throughout the remainder of the hospital.

Based on NFPA's analysis of the fire, the following are considered to be significant factors affecting the outcome of the fire:

1. The lack of automatic sprinkler protection to control the fire in the incipient stage;
2. The lack of early fire detection by automatic means;

3. Arrangement of fuels used in its ignition scenario (deliberately set fire) and the availability of combustible materials in the room of origin (plywood finish) and in the exit corridor (polyurethane mattresses) which allowed rapid fire growth and development;
4. Smoke and fire doors in the room and area of fire origin that were in the open position permitting fire and smoke spread.

Figure 1
St. Jerome
Hospital Fire
Site Plan



**Figure 2
Emergency Room
Floor Plan**

