



HOTEL FIRE
Orlando, FL
January 28, 1984



FIRE INVESTIGATIONS

NATIONAL FIRE PROTECTION ASSOCIATION

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Fire Investigation Report

Howard Johnson's Hotel
Orlando, Florida
January 28, 1984

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In cooperation with

Federal Emergency Management Agency/
United States Fire Administration

and

National Bureau of Standards/
Center for Fire Research

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ABSTRACT

At 1:51 a.m., on Saturday, January 28, 1984, a fire at the 14-story Howard Johnson's Hotel in downtown Orlando, Florida, was reported to the Orlando Fire Department. At the time of the fire, there were approximately 300 guests in the hotel. Upon their arrival, fire crews found many of these guests standing on guest room balconies appearing to be confused and frightened. Fire fighters rescued 10 guests over aerial apparatus and assisted approximately 100 others through exit access corridors and down stairways. The fire resulted in serious injury to three of the estimated 35 to 40 guests on the floor of fire origin (7th floor) and minor injury to an additional 31 other guests and 4 fire fighters.

The 14-story hotel tower was rectangular in shape and was built of pre-cast, reinforced concrete construction with a built-up roof assembly. Guest rooms opened onto a central, east/west exit access corridor. There was an enclosed stairway at each end of the approximately 170-foot long corridor. Intersecting the corridor, approximately midway, was a 29-foot corridor providing access to a bank of three elevators and a furnished lounge area.

Fire protection features in the hotel included 1-hour fire-rated exit access corridors with 1 3/4-inch self-closing guest room doors and an automatic fire alarm system. In addition to the manual pull stations, located near each of the enclosed stairways, the fire alarm system could be activated by the corridor smoke detection system. Additional fire protection features included single-station smoke detectors in guest rooms, standpipe hose located in exit access corridors for occupant use, and a 2 1/2-inch standpipe connection located at each level of the enclosed stairways.

Fire department investigation has listed the cause of the fire as suspicious and determined the point of fire origin to be in the furnished lounge area on the 7th floor. Investigators believe an accelerant had been poured in the lounge area and then ignited.

The accelerant combined with the combustibles in the furnished lounge area generated sufficient heat to buckle one of the elevator shaft doors and ignite electrical insulation on cable in a vertical raceway 19 feet from the point of fire origin. Vertical fire spread was in evidence where the electrical raceway penetrated the 8th and 9th floors. Smoke was able to spread to upper floor levels by this means and through the elevator shaft.

Four significant factors were identified during the investigation as critical in preventing any loss of life and limiting the extent of serious injury. These factors were:

- Rapid detection of the fire by the corridor smoke detection system and automatic notification of the fire department by the hotel's fire alarm system;
- Prompt response and action by hotel staff to the fire condition;
- The protection provided by guest room doors that prevented the penetration of heat and smoke into guest rooms on the 7th floor;
- A comprehensive hotel fire prevention/education program developed to upgrade hotel fire safety in Orlando that provided key fire protection features.

INTRODUCTION

The National Fire Protection Association (NFPA), with assistance from Southern Building Code Congress International, Inc. (SBCCI), investigated the Howard Johnson's, Orlando, Florida fire in order to document and analyze significant factors that resulted in the serious injuries and loss of property.

This study was conducted under a major fires investigation agreement among the Federal Emergency Management Agency/United States Fire Administration (FEMA/USFA), the National Bureau of Standards/Center for Fire Research (NBS/CFR), and the NFPA. The agreement, funded by FEMA/USFA, NBS/CFR, and NFPA, provides for the investigation of technically significant fires by the NFPA's Fire Investigations and Applied Research Division to document and analyze incident details and report lessons learned for fire prevention purposes.

The NFPA was assisted in data collection and analysis by the Southern Building Code Congress International (SBCCI) under an agreement among NFPA and the three model building code organizations to investigate significant structural fires throughout the United States. In addition to SBCCI, the other cooperating building code groups are the Building Code Officials and Code Administrators International (BOCA) and the International Conference of Building Code Officials (ICBO). The three model building code groups are supporting NFPA by lending technical staff support for on-site field work and a building code analysis.

The NFPA became aware of the Howard Johnson's Hotel fire on the day it occurred. Tom Timoney, Fire Protection Specialist in the Fire Investigations and Applied Research Division, and Gary L. Fisher, Associate Engineer, Southern Building Code Congress International, traveled to Orlando, Florida to document the facts related to this fire. A one-day, on-site study and

subsequent analysis of the incident are the basis for this report. Detailed data collection activities were made possible by the cooperation of the Orlando Fire Department. This report presents the findings of the data collection and subsequent analysis efforts.

This report is another of NFPA's studies of fires having particular educational or technical interest. The information presented is based on the best data available during the on-site data collection phase and further data acquired through subsequent follow-up. It is not NFPA's intention that this report pass judgment on, or fix liability for, the cause for injury and property damage at the Howard Johnson's Hotel. This report describes fire safety conditions at the Howard Johnson's Hotel and presents findings on contributing factors to the serious injuries and loss of property based on NFPA's analysis of collected data and observations during the investigation.

The cooperation and assistance of Assistant Chief William E. Moran, Commander-Fire Prevention Division, and Investigators John R. Hackett and Laurie Fraser of the Orlando Fire Department are greatly appreciated.

A special thanks to Mr. Gary L. Fisher, Associate Engineer, Southern Building Code Congress International, for his on-site assistance in the data collection phase and for his input into the code analysis and the report writing process.

BACKGROUND

Building plans for the 14-story Howard Johnson's Hotel complex were approved in October, 1971 by the Orlando Fire Department. Construction of the downtown hotel was completed in the latter part of 1972. Included in the 14-story high-rise hotel complex were a restaurant, a night club and two convention halls.

The hotel complex was built of pre-cast, reinforced concrete construction with floor slabs and a common built-up roof assembly supported by concrete columns. The 14-story high-rise tower had dimensions of 170 feet by 60 feet. A 2-hour fire-rated enclosed stairway was located at both the east and west end of the building.

The ground floor contained the hotel reception desk, a lounge, and an attached 1-story restaurant building. The second floor featured a night club and two convention halls. Floors 3 through 13 were configured with 22 guest rooms opening onto a 1-hour fire-rated east/west exit access corridor. (See Figure 1.) The 14th floor had a combination of guest suites and conference rooms.

Approximately 57 feet in from the west end of the building, a 29-foot north/south corridor provided access to a bank of three elevators. Across this corridor from the elevators on odd-numbered floors 3 through 13 was a furnished lounge which contained two cushioned wicker chairs and a table with a lamp at each end. On even-numbered floors 4 thru 12, this area contained an ice maker and selected vending machines.

Two 8 inch by 10 inch steel raceways containing electrical cables ran vertically from the ground floor through the 14th floor supplying electrical power to floors 2 thru 14. These vertical raceways were enclosed with non-fire rated construction and located approximately 31 feet to the east and 19 feet to the west of the intersection of the elevator access corridor and

the east/west corridor. (See Figure 1.)

Fire protection features of the building included 1-hour fire-rated exit access corridor construction with 1 3/4-inch solid wood-core guest room doors with self-closers, a fire alarm system, single-station smoke detector protection in guest rooms, an emergency telephone network with phones for emergency use located on each level in the enclosed stairways, and a standpipe system with two standpipe cabinets on each floor equipped with 1 1/2-inch hose and a portable fire extinguisher. A 2 1/2-inch gated hose connection was also provided in both enclosed stairways at each floor supplied by the standpipe riser.

The automatic fire alarm system integrated an automatic corridor smoke detection system and manual pull stations into a zoned fire alarm annunciator panel located behind the hotel's reception desk. Manual pull stations were located throughout the hotel at the exits on each floor. The corridor smoke detection system used photo-electric detectors uniformly spaced throughout the corridors on each floor. Activation of a corridor smoke detector or manual pull station would sound an audible alarm on the fire floor and the floor above and below the fire floor, illuminate the zone of the alarm on the fire alarm panel, recall the elevators to the ground floor, shut down the HVAC system, and notify the fire department through a central station fire alarm monitoring service. The audible alarm would sound for 15 seconds followed by 30 seconds of pre-recorded verbal instructions telling occupants on the floors of activation to exit through enclosed stairways and do not use elevators. If the smoke detection system did not clear itself or manual pull stations reset within 60 seconds, the fire alarm system in the remaining portions of the hotel would activate sounding 15 seconds of alarm followed by the 30 seconds of pre-recorded verbal instructions.

The Orlando Fire Department has developed a comprehensive fire prevention/education program, of which high-rise hotel fire safety is one component. Records from the Fire Prevention Division indicate that 65 employees of the Howard Johnson's Hotel attended a one-hour training program on hotel evacuation procedures in February of 1981. Two one-hour fire education programs were also presented to Howard Johnson's employees in August and again in September of 1983. These two education programs were attended by 194 employees and management of the hotel. The education programs incorporated basic hotel fire safety concepts such as the importance of hotel staff immediately notifying the fire department and assisting guests in exiting through enclosed stairways, in addition to the proper use of fire extinguishers.

THE INCIDENT

At 1:51 a.m., on Saturday, January 28, 1984, the Orlando Fire Department received notification through a central station fire alarm monitoring service of a fire at the Howard Johnson's Hotel. Shortly thereafter, the fire department received telephone verification from a hotel employee at the fire alarm panel of a fire alarm signal in the 7th floor smoke detector zone.

After its initial cycle on the affected floors, the audible alarm sounded throughout the building and a security guard working in the first floor area checked with the registration desk for the fire location. After receiving the location of the alarm, he moved quickly up the west stairway to the 7th floor. When he opened the 7th floor stairway door, he found the floor charged with heat and thick smoke. He located a mother and child (room 715) slumped against the corridor wall adjacent to the stairway exit door. The guard removed them from the corridor and down the stairway to the outside of the building.

"First in" fire department units arrived at 1:54 a.m. and were confronted with a large number of guests standing out on balconies, appearing to be confused and frightened. They observed that many of these guests had already begun to tie sheets together and, in some cases, were lowering themselves from balcony to balcony in an attempt to escape from the building. A fire ground officer spoke to these guests over a public address system and instructed them to return to their rooms where fire fighters would be coming shortly to lead them out of the building.

Fire fighters rescued 10 guests over aerial apparatus and assisted approximately 100 other guests in exiting their rooms through corridors and down enclosed stairways. Fire fighters searched all the guest rooms on floors 7 through 14. Search and rescue operations were slowed because the hotel had only one master key, which resulted in fire fighters having to forceably enter approximately 40 guest rooms on the 7th and 8th floors. Fire fighters did not enter guest rooms on floors 3 through 6 instead, they knocked on guest room doors to alert any remaining guests and assist them in exiting.

The fire fighting crews on the 7th floor found the corridor charged with intense heat and thick black smoke. They located a smoldering fire in the furnished lounge area across from the elevators. Also, in this same area, fire fighters found one male guest (room 719) unconscious, lying in the corridor. This individual was removed by the fire fighters and revived by the fire department paramedics.

Fire crews working on the 8th floor found fire extension from the 7th floor through an unprotected electrical raceway. Simultaneously, fire crews working the 8th and 9th floor also found extension of the fire in the same unprotected raceway. These fire crews removed the steel plates which covered the raceways and quickly extinguished the burning cable insulation.

Damage

Fire damage on the floor of fire origin (7th floor) included furnishings in the lounge area, corridor carpeting, vinyl wallcovering, ceiling materials, and heat damage to several solid core-wood guest room doors. While the area of fire involvement was limited to a portion of the furnished lounge, heat generated from this fire was severe enough to buckle one of the adjacent elevator shaft doors, and migrate 19 feet west, igniting electrical cable insulation in the unprotected vertical raceway.

There was moderate smoke damage in guest rooms throughout the 7th floor. Moderate to heavy smoke damage was documented in rooms 709, 715, 717, 719, 721 and 723. The pattern of more severe smoke damage on the south side of the building can be traced to the fire department's ventilating heat and smoke from the 7th floor by propping open guest room doors and opening sliding glass balcony doors. A second factor in the guest room smoke damage pattern was the movement west of the fire in the corridor. A third factor, which is more difficult to identify, in smoke damage in guest rooms resulted from guests opening and closing their doors while attempting to evaluate conditions in the corridor and/or escape from the building.

Floors 8 through 14 received varied amounts of smoke damage in the corridors, linked to smoke movement through the unprotected raceway and smoke migrating through the elevator shaft. Smoke also penetrated into the enclosed stairway as a result of fire fighters assisting in evacuating the upper floors of the building.

Injuries

The 32-year-old mother (room 715) rescued from the 7th floor corridor by the hotel security guard suffered burns over 25 percent of her upper body. Her 6-year-old son (room 715), also rescued by the security guard, suffered

burns over 15 percent of his body. At the time of this report, both mother and child were successfully responding to burn treatment at a local hospital.

A female occupant of room 717 was treated for first-degree facial burns, eye injuries, singed hair, and constriction of the throat. The occupant of room 719, who fire fighters found lying unconscious in the corridor adjacent to the 7th floor elevators, was revived at the scene by fire department paramedics. At the time of this report, he remained in serious condition in the cardiac care unit of a Veterans Hospital with severe complications stemming from his cardiac arrest.

The remaining 30 guests and four fire fighters who were transported to area hospitals as a result of the fire were treated for smoke inhalation and lacerations. Guests suffered these lacerations smashing out the glass in sliding glass doors leading to guest room balconies, unaware that these doors were operable.

Discussion

Investigators from the Orlando Fire Department have determined the fire to be incendiary in nature, although the exact ignition scenario is not known. Laboratory tests to identify the accelerant poured in the 7th floor lounge and nearby corridor are still incomplete. However, fire department investigators speculate that the accelerant was poured in the lounge area and the nearby corridor and then ignited by an individual(s) standing in an elevator who then used this means to escape or relocate in the building.

Because the fuel package ignited by the accelerant was located almost directly beneath a photo-electric detector in the corridor, rapid fire detection and activation of the fire alarm system resulted. This may explain the observations of some 7th floor guests who entered the corridor upon hearing the fire alarm and found no evidence of a fire condition. Some of

these guests then moved toward the elevators, where they encountered deteriorating corridor conditions created by the rapid build-up of heat and smoke.

Fire department investigators were able to gain some insight into early fire growth and development from accounts given by injured guests of rooms 715, 717 and 719. The mother in room 715 described being alerted to the fire by the hotel's fire alarm system. She opened her guest room door and, finding no signs of fire in the corridor, moved with her son toward the elevators. However, conditions within the corridor began to deteriorate as they continued toward the elevators. They then turned and moved toward the west stairway, but were overcome by products of combustion before reaching the stairway.

A guest of room 717 also heard the fire alarm and, after checking the condition of the corridor, began to move toward the elevator. She described seeing no signs of fire as she entered the corridor. As she moved towards the elevators, however, she encountered the fire and was forced to crawl back to her room where she was later assisted from the building by fire fighters.

Room 719 was occupied by two guests. They also were alerted to the fire by the activation of the fire alarm system. Upon examining the corridor, they discovered a light haze of smoke. One of the guests entered the corridor; the other guest was delayed approximately a minute before he too entered the corridor. The latter exiting guest described smoke and heat in the corridor. He escaped the building by traveling through the corridor to the west stairway. The other guest was later found unconscious by fire fighters in the corridor by the furnished lounge.

This incident documents the valuable contribution a trained hotel staff can make in preventing the loss of life and reducing the number of serious injuries. In this incident, the hotel staff took two significant actions:

they immediately verified with the fire department the receipt of a fire alarm signal and gave the 7th floor location; and they travelled through the enclosed stairway to the fire floor in order to assess the fire condition and lend assistance to guests. The failure of employees in other hotel fire investigations to take similar actions has been identified by the NFPA as a critical factor which contributed directly to an increased fire severity and a resulting increased loss of life.* The credit for the prompt hotel employee reaction to the fire belongs to the management and employees of Howard Johnson's and the Orlando Fire Department who worked together to see that the hotel employees had the opportunity to participate in a comprehensive fire prevention/education program.

The City of Orlando and the fire department have also worked closely with representatives of the hotel industry to upgrade the level of fire safety in hotels throughout the City of Orlando. The benefits of this cooperative program can be seen in this incident. When the hotel was constructed, local ordinances did not require smoke detector protection in either the corridors or guest rooms, nor were self-closers required on guest room doors. Since that time, however, the building was retrofitted with self-closers on all guest room doors, automatic smoke detector protection was provided in the corridor, and single-station smoke detector protection was installed in the guest rooms. The activation of the corridor smoke detection system led to prompt detection, employee reaction, and fire department response.

The state of Florida has also become involved in hotel fire protection issues. A recently enacted Florida state law will require that this hotel and others like it be retrofitted with complete automatic sprinkler protection by the year 1990.

*Westchase Hilton Hotel, Houston, Texas, March 6, 1982.

Inn on the Park, North York, Ontario, January 17, 1981

Howard Johnson's Motor Lodge, Concord, MA, December 4, 1976

Cavalier Beachfront Hotel, Virginia Beach, Virginia, September 8, 1974.

ANALYSIS

The two metal electrical raceways which ran vertically from the ground floor through the 14th floor were not enclosed in fire rated construction nor protected at the point of penetration through each fire-rated floor assembly. Because there was no protection of the vertical electrical raceways, the fire which resulted from the ignition of cable insulation at the 7th floor level was then able to spread in the raceway to the 8th and 9th floors before fire crews were able to extinguish it. The unprotected raceways were also a means by which smoke was able to spread to floors above the fire. The 1981 edition of the Life Safety Code^o requires these raceways to be protected by one of the methods outlined in its section 6-2.2.8 or be enclosed with fire rated construction. The 1982 Edition of the Standard Building Code also requires the raceways be protected by one of the methods outlined in Section 701.1f.*

The severe conditions created in this fire by the ignition of an undetermined quantity of accelerant in combination with the furnishings in the 7th floor lounge area quickly produced untenable conditions in the 7th floor exit access corridor. The Standard Building Code, requires the elevator lobby to be separated from the exit access corridor by 1-hour fire-resistive construction (SBC 506.6a1 and Table 700). The Standard Building Code does not permit furnished lounge areas to be located in the elevator lobby by limiting the openings allowed in the elevator lobby to those required for access to the elevators and for egress from the building (SBC 506.6a1).

*The code comparison is presented in the interest of comparing life safety problems observed in the aftermath of this incident to the latest edition of the Life Safety Code and the Standard Building Code for new construction. The areas addressed were not all inclusive of the code sections that might apply to a building of this type, but are those felt to impact the greatest on the life safety problems.

The Standard Building Code requires that all buildings greater than 12 stories or 150 feet in height be protected with complete automatic sprinkler protection. The Life Safety Code requires all hotels greater than six stories in height to be protected throughout by complete automatic sprinkler protection when such buildings are not provided with smoke-proof towers.

This incident documents contributions of several fire protection components and an overall fire protection program. In this incident, the corridor smoke detection system alerted hotel staff, hotel guests, and the Orlando Fire Department to a fire condition on the 7th floor at its incipient stage. This provided hotel staff the opportunity to rescue two guests overcome in the corridor by smoke and heat. It also allowed guests on the 7th floor, as well as guests on the remaining upper floors of the hotel, the opportunity to safely exit the corridors to the enclosed stairways. Not all the 7th floor guests were able to leave their rooms and exit through the corridors before smoke and heat conditions became threatening, however, construction features such as one-hour fire-rated construction, 1 3/4-inch solid core wood doors, and operable sliding glass balcony doors enabled them to stay in their rooms until fire fighters arrived and were able to assist them.

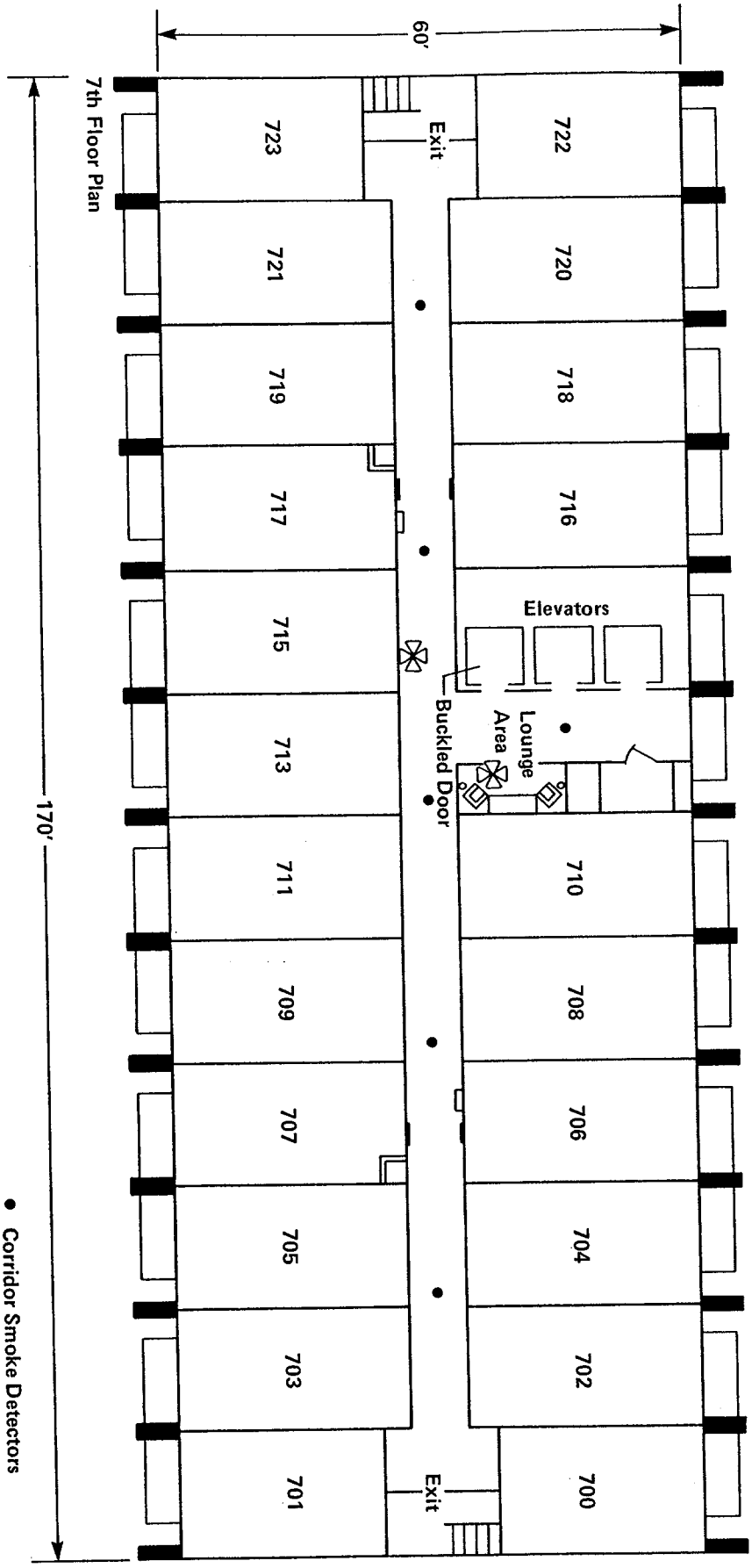
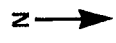
Because the fire department was automatically notified of a fire by the hotel's fire alarm system, "first-in" fire department units were on the scene approximately 3 minutes after the first detector activated. The immediate notification of the fire department provided fire crews the opportunity to quickly extinguish the fire on the 7th floor and limit the extension of the fire in electrical insulation on cables in the raceway on the 8th and 9th floors. The rapid response of the fire department also enabled fire ground commanders time to calm and reassure frightened guests some of whom had begun

climbing down from balcony to balcony on sheets. In addition, the firedepartment was able to reassure other guests who were preparing to jump from their guest room balconies.

This incident further documents the difficult problem of educating the public in the proper actions to take in the event of a hotel fire. Despite large multi-colored placards on each guest room door depicting a simple floor plan and the nearest stair tower to travel to, coupled with vocal instructions designed into the hotel's fire alarm system, instructing occupants not to use the elevators during a fire emergency, guests still made fundamental errors such as attempting to exit using elevators. Additionally, guests on floors below the fire, completely unexposed to smoke or heat, chose, in some cases, to break the glass in operable sliding glass balcony doors and begin to lower themselves to the ground using sheets rather than exiting through uncontaminated corridors to stairways.

Howard Johnson's Downtown

Colonial Drive



7th Floor Plan

Hughey Avenue

- Corridor Smoke Detectors
- ┌ Electrical Panel
- Vertical Cable Raceways
- ▣ Fire Hose Cabinet
- ⊗ Accelerant Pour Areas