On Tuesday, June 14, 1983, five people died of "asphyxiation due to inhalation of smoke and carbon monoxide" and 33 others were injured in an early-morning fire at the Ramada Inn Central Hotel, approximately two miles east of downtown Fort Worth, Texas.

The two-story structure involved in the fire was of protected wood-frame construction and contained 90

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guest rooms and conference rooms. It was part of a five-
building hotel complex that included a combination
lobby/restaurant building and three other buildings
housing guest rooms.

The building was not protected by automatic sprinklers or smoke detectors, and had no fire alarm system. Interior corridors were connected by three unenclosed interior stairways. The fire originated in the first-floor corridor, adjacent to an exit, and initially involved 23 rolls of carpet and padding that had been stored in the corridor because the building was being renovated.

Fire fighters found the bodies of all five of the victims in their rooms, four on the second floor and one on the first floor.

The primary factor that led to the casualties was the high combustible loading present in the corridor due to the storage of rolled carpet and padding, the unprotected vertical openings created by the open interior stairways, the lack of early warning detection, and the lack of an alarm system to alert occupants to the fire. In addition, because of the rapid growth and spread of the fire throughout the exit access corridors, many guests were injured while escaping through fixed plate-glass windows that had to be broken.

BACKGROUND

The Building

The fire occurred in a guest-room building of the Ramada Inn Central Hotel complex. In addition to the fire building, the Hotel complex consisted of three other guest-room buildings and a building that housed the registration lobby, restaurants, and function rooms. Each of the five buildings was detached from the other buildings (see Figure 1).

Construction of the 350-by-60-foot, two-story fire building was completed in 1973. Originally, the building exterior had been constructed with exposed redwood plywood, with some areas highlighted in stucco on metal lath. Sometime during its operation, exterior alterations were made. The redwood plywood had been covered with metal lath and stucco so that at the time of the fire, the exterior skin consisted of either stucco or metal panels around the windows.

The building contained 32 guest rooms and eight conference rooms on the first floor and 48 guest rooms on the second floor. The guest rooms were served by a central, interior exit access corridor, as shown in Figure 2. Two two-story luxury suite units, located to the west of the west entrance, had separate entrances from the outside; they were not involved in the fire, but did sustain some smoke damage.

All of the guest rooms (except the two-story luxury suites) opened onto the 330-foot-long corridors on both floors, which were interconnected by three unenclosed interior stairways. An exterior stairway served the east end of the building (see Figure 2). Each interior stairway had at least one direct exit to the exterior at ground level.

Heights and Areas

Each floor covered approximately 21,000 square feet, which included the luxury-suite units. The building had
two locations where the floor stepped up approximately two feet. The four-foot differential in height for the length of the building resulted in a very gently sloping exterior ground line. The building was typical for a two-story frame structure, approximately 17 feet in height. On three sides, it was adjoined by public streets and/or yards for a width of at least 60 feet.

Construction Details

The wood-framed building most nearly resembled protected wood-frame construction (Type V [111]) construction per NFPA 220-1979, Standard Types of Building Construction, or Type V one-hour construction per the 1982 Uniform Building Code). The exterior walls consisted of wood studs with gypsum sheathing, redwood siding, and stucco on the outside face. The inside face was covered with gypsum wallboard. The partitions separating the corridor from the guest-room units and the partitions between units were of wood framing with ¾-inch, Type “X” gypsum wallboard on each face. There was fiberglass batt insulation in the stud cavities of the corridor walls.

The floor/ceiling assembly consisted of 1½ inches of lightweight concrete fill on ¾-inch plywood on 16-inch centered 2-by-8-inch joists, with a ceiling membrane of ¾-inch, Type “X” gypsum wallboard. The roof/ceiling system was very similar, except that it did not have the concrete fill and the joists were spaced at 24-inch centers. There was fiberglass batt insulation in the ceiling joist spaces. The roof overhang and soffit were of unprotected, combustible construction. The roof was flat and did not have an attic space that is common with a pitched roof.

All four stairways were constructed of wood. The three interior stairways had an enclosed space below, but there was no access to it. The stairway areas were approximately ten feet wide, with a stair width of about four feet.

The 36-inch doors to the guest rooms were of 1¾-inch-thick, solid-core construction, and appeared to be made of some type of pressed composite board with a veneer facing. Guest-room doors were not self-closing.

Construction around the doors consisted of a 2-by-4-inch lumber rough opening with wood frame, trim and stop, and casing. Some of the casing material appeared to be vinyl-covered. This manner of framing the doors resulted in large gaps between the framing and the door frame. The gypsum wallboard covered only the lower portion of the framing and did not extend to the wood door frame. This left a cavity (gap) that was covered only by the door casing.

Each guest room had a large (approximately 60-by-60-inch) fixed-pane exterior window with a sill height of less than 40 inches. The panes were reportedly a single thickness of ¼-inch plate glass. Adjacent to each window was a through-the-wall combined heating, ventilating, and air-conditioning (HVAC) unit.

The guest rooms had recently undergone some refurbishing, new vinyl wall covering had been applied to the interior walls. It is believed that the original ceiling of

(Continued on page 60)
Weather Conditions

At the time of initial fire discovery, the sky was cloudy, the temperature was 78°F, and there was a 13-knot wind from the south. A heavy rainstorm, accompanied by shifts in wind direction, occurred during the fire-fighting operations. This is further discussed later in this report, under "The Fire."

Public Protection

The City of Fort Worth, Texas, covers an incorporated area of 250 square miles and has a population of approximately 397,000 people. It is protected by the Fort Worth Fire Department, whose $24 million budget supports a staff of 679 authorized positions. In June 1983, approximately 575 positions in the fire-fighting division were filled. Total manning per shift was approximately 190. Divisions were concentrated in the areas of fire operations, fire prevention, fire training, fire services, fire safety education, and fire administration. Equipment and personnel were assigned to 30 stations.

Code Enforcement

The building was constructed during a period when the 1970 edition of the Uniform Building Code was in effect, with amendments, in the city of Fort Worth. Although amendments had been made to the model code, they are not believed to have had any impact on this structure.

THE FIRE

Ignition Sequence and Discovery

Just before 2:30 am, the hotel security guard had made his rounds through the guest-room building. He later reported that he had seen no evidence of a fire. Between 3:00 and 3:15 am, the guard left the lobby building on rounds. As he approached the west entrance of the guest-room building, which was approximately 40 feet from the lobby, he could see fire and smoke through the floor-to-ceiling glass lites (panels) on each side of the west entrance door. After determining that the rolls of carpet and padding in the hallway were on fire, he went to the registration desk in the lobby building and asked the desk clerk to call the fire department. The desk clerk called the telephone company operator, who called the fire department at 3:22 am. The fire department received a second call at 3:23 am from a school security guard making rounds in the area by automobile, and dispatched the first-alarm assignment at 3:24 am.

After the fire department was notified, the hotel secu-
curity guard obtained fire extinguishers from another building in the hotel complex and returned to the west end of the first-floor corridor, where the rolled carpet and padding were burning. He and two hotel guests fought the flames until the extinguishers were empty. During the extinguishment attempt, the west entrance door was propped open and remained that way, supplying fresh air to the fire.

Fueled by the unusually high combustible loading presented by 23 rolls of carpet and padding stored in the corridor, the fire and smoke spread rapidly through the two-story corridor system by way of the three open interior stairways.

Shortly after the fire was discovered (at approximately 3:25 am), a hotel bartender drove her car around the fire building, honking the horn to alert hotel guests to the fire. A hotel cook knocked out many first-floor guest-room windows to allow the occupants to escape. One of the two night auditors honked his car horn, then used a crowbar from the car to break out windows. The other auditor phoned guest rooms to inform guests of the blaze and told them to evacuate immediately. The auditor does not know how many rooms he called before the telephone lines went dead. Some guests reported that they had called the hotel desk to seek information and/or report smoke in their rooms.

Awakened by the sound of car horns and breaking glass, guests attempted to leave their rooms by way of the corridors, only to find the corridor environment untenable because of thick smoke and fire. By this time, many guest rooms had been infiltrated by smoke. The growth, development, and spread of fire products were so rapid, and notification had been so delayed, that all reported escapes were made through broken-out windows. There were no reports of guests using the corridors and stairs to escape. Several first-floor occupants placed their mattresses on the ground to cushion the fall of second-floor occupants.

Fire Growth and Development

The fire growth, development, and spread were very rapid. The fire started at the west end of the first-floor corridor near an open interior stairway to the second-floor corridor. The burning rolled carpet and padding spread the fire to the existing floor carpeting and wall covering material, producing thick, acrid smoke. The fire traveled horizontally down the corridor and vertically up the open stairway at the west end, and subsequently up the remaining stairways. The corridor carpeting and vinyl wall covering were consumed as the fire progressed. A fresh supply of oxygen was provided through broken entranceway windows and guest-room doors left open by guests prior to their escape through broken windows. Once the fire barrier provided by guest-room doors in the exit access corridor was voided, the fire quickly spread into several guest rooms on both floors of the building, complicating suppression of the fire. The operation of two five-ton, rooftop-mounted air-conditioning units allowed some outside makeup air, in combination with recirculated air, to move down the second-floor corridor, and possibly influenced initial smoke spread along that corridor. However, the most significant factor causing the fire spread to the second floor was the unenclosed interior stairway.

Fire Fighting and Rescue

The first alarm dispatched a pumper, a ladder, a quint (a combination pumper/ladder truck), and an attack pumper (a four-wheel-drive rapid-response vehicle), with a district chief and a fire investigator. The first-responding fire companies traveled the half mile to the hotel in two minutes. On their arrival, they observed heavy smoke coming from broken guest-room windows and entranceway windows at both ends of the building, an advancing fire within the building, and trapped guests visible at guest-room windows.1 The district chief arrived at the scene one-half minute later and took command, requesting a second alarm when he learned that people were trapped, and then a third alarm.

Initial fire department efforts involved breaking out exterior windows, raising ladders to rescue guests trapped on the second floor, and assisting guests out of

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1 These observations were noted at the southeast portion of the building (first and second floors); the fire originated in the west end of the first-floor exit access corridor.
first-floor windows. Fire fighters from the first-responding pumper and ladder companies assisted occupants from the south side of the building and gave first aid. The next-arriving companies helped rescue guests from the north side of the structure. The two north-side units were hampered by heavy smoke carried in that direction by wind from the southeast, which forced them to wear self-contained breathing apparatus even outside the building. Visibility was poor.

Only after the third alarm did fire fighters have sufficient personnel to begin attacking the fire with handlines, in addition to continuing rescue operations. By this time, the fire had spread throughout the first- and second-floor corridor areas and into several guest rooms on both levels. The district chief requested a fourth alarm at 3:34 am, a fifth alarm at 3:58 am, and at 4:04 am requested mutual aid from Arlington. In all, 100 Fort Worth and Arlington fire fighters were at the fire scene.

Fire-fighters' visibility and radio communications were hampered by a heavy thunderstorm that began shortly after 4:00 am.

Two-inch-diameter hose (both conventional double-jacket and neoprene rubber), used in two attempts to make an interior attack on the fire, ruptured after being cut by glass from broken windows, forcing fire fighters to withdraw from the area of attack. An exterior attack, with handlines and ground and aerial master streams, was eventually used to gain control of the fire. At 10:10 am, the fire was reported under control.

Triage and First Aid

A rehabilitation and treatment (triage) sector to assist the injured was set up at 3:45 am east of the fire building, in the parking lot of a multistory bank building across Beach Street. Within 30 minutes, heavy rains forced a relocation under the open-air canopy of the bank building's entrance. After 45 minutes, bank officials opened the bank's lobby area for triage use.

Private ambulances transported 33 injured people to four area hospitals. 32 hotel guests plus the hotel cook, who suffered from smoke inhalation during his rescue efforts. Injuries included smoke inhalation (25), lacerations (5), sprain/fracture (2), and chest pains (1). All but seven of the injured were treated and released from the hospitals.

The Fatalities

All five of the fatalities occurred in guest rooms and all of the victims were found out of their beds. The Tarrant County Medical Examiner's Office attributed all of the deaths to "asphyxiation due to inhalation of smoke and carbon monoxide."

Fire Damage

Fire damage was so extensive that most of the second floor was gutted structurally and devoid of furnishings. Roof collapse occurred above the second-floor corridor. A rooftop air-conditioning unit serving the corridors dropped to the second floor. On the first floor, the
west-end entrance and adjacent portions of the corridor were gutted. Selected guest rooms where doors had been left open received fire damage, whereas rooms that had remained closed evidenced little fire damage. The gypsumboard ceiling in the corridor dropped to the floor. The two luxury suite units received smoke damage, but no fire damage. Overall, property damage exceeded $1.5 million.

Discussion

The Fort Worth Fire Department determined that the fire was of suspicious origin. Testing performed in the laboratories of the Bureau of Alcohol, Tobacco and Firearms (ATF) revealed no traces of accelerants in the area of fire origin. Fort Worth Fire Department investigators have discounted discarded smoking materials as a possible ignition source. Specific ignition details remain undetermined.

Twenty-three rolls of carpet and padding, stored in the west-end entrance and corridor, provided the combustible loading necessary for rapid fire development. When this occurred, extremely heavy smoke conditions developed quickly. Vinyl wall covering and synthetic fiber carpeting on the corridor floors were consumed as the fire spread through the first-floor corridor. The open interior stairways allowed the fire and products of combustion to travel to the second floor, where the fire spread continued along the corridor, consuming combustibles as it spread. Fire spread along guest-room carpeting was minor (up to 4 inches) in guest rooms closest to the area of fire origin.

The initial fire development, with extremely heavy smoke production, created untenable conditions in the corridor system before the fire was detected and before the guest-room occupants could be alerted to the fire. Because there was no building alarm system, guests were not notified early in the fire. The sleeping guests were awakened by hearing car horns outside, the sounds of breaking glass, and/or by telephone calls made to guest rooms.

The fire was advancing when fire department personnel arrived. Fire fighters initially on the scene reported heavy smoke coming from broken guest-room windows and from the entranceway windows to corridors at both ends of the building. Suppression of the fire was delayed until trapped guests were rescued. After first checking the condition of the exit access corridors and finding them untenable, occupants were forced to use the exterior windows as their only means of escape. All reported escapes were made through broken-out window openings. The exterior windows were fixed and extremely difficult to break, which resulted in delayed escapes and laceration-type injuries.

Performance of Fire Protection Features

A first-floor inspection of the wall and floor/ceiling assemblies showed that they had performed in the manner expected of fire-rated construction used for compartmentation. Although most of the ceiling gypsumboard was not in place after the fire, it was evident that it had performed well, because very little charring or other
deterioration of the floor joists was observed. The same can generally be said for the wall assemblies; however, most of the gypsumboard remained in place. At about ten locations along the corridor, metal fire extinguisher cabinets were recessed into mechanical chases. The cabinets had 2X wood firestopping, and in most cases provided sufficient protection against penetration into the fire-resistive construction.

On the second floor, the wall and roof/ceiling assemblies were in a much more distressed state, with much evidence of charring and gypsumboard disintegration. This may be attributed to the accumulation of heat and the duration of exposure. The fire vented itself through the ceiling of the corridor on the second floor at about the same time that fire fighters were venting the structure. Therefore, a more definite determination of the ability of the roof/ceiling assembly to perform as desired could not be made.

The vertical spread of fire was almost entirely by way of the three open interior stairways. Other penetrations between floors did not appear to be transmitters of heat, smoke, and gases to the upper floor.

Fire damage to a guest-room door assembly. Products of combustion easily penetrated some guest rooms because of the poor door assembly arrangements.

The top part of the door frame to some guest rooms was charred extensively and burned away. The door and finish material arrangements, as previously discussed, resulted in cases where the top of the door may have been as much as 2 inches below the framing. This may have been one reason why door openings in some cases did not perform as well as others.

Given the magnitude of the fire created by the burning of the stored rolled carpet and padding, the effect of the existing wall and floor coverings on the corridor fire spread was difficult to evaluate based on on-site observations. As a result, the National Bureau of Standards/Center for Fire Research (NBS/CFR) tested samples of the existing corridor carpet material salvaged after the fire, in order to determine an interior floor finish classification. The carpet was tested to NFPA 253 (ASTM E-648), Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source. The carpet achieved a critical radiant flux of 0.13 watts per square centimeter (w/cm²). Thus, it would receive no classification because it did not qualify as Class I (minimum 0.45 w/cm²) or Class II (minimum 0.22 w/cm²) interior floor finish per the classification scheme of Section 6-5 of NFPA 101, the Life Safety Code. Material analysis indicated that the stored padding was a 50/50 percent blend of polypropylene and nylon with traces of polyester.

The NBS/CFR also tested samples of the new vinyl wall covering that had been installed in the corridor, in order to determine an estimated flame spread classification. Samples were tested to ASTM E-162, Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source. Although this test method is not equivalent to and does not correlate well with NFPA 255 (ASTM E-84), Method of Test of Surface Burning Characteristics of Building Materials, NBS/CFR personnel believe that the flame spread index developed using ASTM E-162 is indicative of a Class A interior finish material (as defined by Section 6-5 of NFPA 101, the Life Safety Code).

Code Analysis

As previously stated, the fire building at the Ramada Inn Central was constructed during a period when the 1970 edition of the Uniform Building Code was in effect, with amendments, in the City of Fort Worth. The following information is presented in order to compare life-safety problems observed in the aftermath of this fire with the requirements of the 1981 edition of NFPA 101, the Life Safety Code, and the 1982 edition of the Uniform Building Code. The areas covered, with some paraphrasing, are not all inclusive of the code sections that might apply to a building of this type, but are those areas felt to impact the most on the life-safety problems.

CODE COMPARISON


1. Obstructions, Storage
   5-1.6.3 Means of egress shall be free of obstructions which would prevent its use.

   5-1.3.3 No exit enclosure shall be used for any purpose which would interfere with its use as an exit, such as for storage or similar purposes.

   16-2.5.1 (new) and
   17-2.5.1 (existing).
   Access to all required exits shall be in accordance with Section 5-5, shall be unobstructed, and . . . .

2. Detection
   16-3.4.3 (new) Buildings shall have a corridor smoke detection system connected to the alarm initiation system.

3. Alarm
   16-3.4.1 (new) and
   17-3.4.1 (existing)
   An alarm system, in accordance with Section 7-6, shall be provided for any hotel having accommodations for 15 or more guests.

   16-3.4.2 (new) and
   17-3.4.2 (existing)
   Every sounding device shall be of such character and so located as to alert all occupants of the building or section thereof endangered by fire.

   16-3.4.4 (new) and
   17-3.4.3 (existing)
   A manual fire alarm station shall be provided at the hotel desk or other convenient central control point under continuous supervision of responsible employees.

   16-3.4.6 (new) and
   17-3.4.4 (existing)
   Provisions shall be made for the immediate notification of the public fire department by either telephone or other means in case of fire.

4. Vertical Opening Protection
   2-9. Every vertical way of exit and other vertical opening between floors of a building shall be suitably en-

1982 Uniform Building Code

Section 3301(b) Definitions.
   Exit is a continuous and unobstructed means of egress to a public way . . . .

Section 3301(c) Exit Obstruction.
   Obstructions shall not be placed in the required width of an exit except projections permitted by this Chapter.

Section 1210(a) Fire-Warning Systems.
   Every dwelling unit and every guest room in a hotel or lodging house used for sleeping purposes shall be provided with smoke detectors conforming to UBC Standard No. 43-6. In an efficiency dwelling unit, hotel sleeping room and in hotel suites, the detector shall be centrally located on the ceiling of the main room or hotel sleeping room.

Section 1202(b) Special Provisions.
   Every hotel containing 20 or more guest rooms shall have an approved fire alarm system as specified in the Uniform Fire Code. (See Note 1.)

See Note 1.

See Note 1.

Note 1: Related sections of the Uniform Fire Code include Section 10.307(a), Apartments and Hotels for alarm system and smoke detection locations, Section 10.307(d), and Section 10.307(c) for installation, inspection, and maintenance provisions.
CODE COMPARISON (continued)


4. Vertical Opening Protection (continued)
closed or protected, as necessary, to afford reasonable safety to occupants while using exits and to prevent spread of fire, smoke, or fumes through vertical openings from floor to floor before occupants have entered exits.

16-3.1.1 (new) Every stairway, elevator shaft and other vertical opening shall be enclosed or protected in accordance with 6-2.2.

17-3.1.1 (existing) Every stairway, elevator shaft and other vertical opening shall be enclosed or protected in accordance with 6-2.2 or provide means of satisfying the requirements of Section 2-9.

5. Doors and Closers

16-3.6.2 (new) Each guest room door which opens onto an interior corridor shall have a fire protection rating of at least 20 minutes. Openings shall resist the passage of smoke.

17-3.6.2 (existing) Each guest room door which opens onto an interior corridor shall have a fire protection rating of at least 20 minutes.

6-2.2.5 Exception No. 2: Where the fire barrier is provided as a result of a requirement that corridor walls be of 1-hour fire-resistive construction, the opening protectives shall have a fire protection rating of not less than 20 minutes when tested in accordance with Standard Methods of Fire Tests of Door Assemblies, NFPA 252, without the hose stream test.

16-3.6.3 (new) and
17-3.6.3 (existing)
Doors between guest rooms and corridors shall be self-closing . . .

6. Operable Window

7. Interior Finish

6-5.1.4 The classification of interior finish materials specified in 6-5.1.5 shall be that of the basic material used by itself or in combination with other materials.

Exception No. 1: Subsequently applied paint or wall covering not exceeding 1/28 in. in thickness.

1982 Uniform Building Code

Section 3305(h) Openings. 1. Doors.
Every door opening (of a corridor serving a Group B, Division 1 occupancy having an occupant load of 10 or more) shall be protected by a tight-fitting smoke- and draft-control assembly having a fire protection rating of not less than 20 minutes when tested in accordance with UBC Standard No. 43-2 without the hose stream test.

Section 3305(h) Openings. 1. Doors.
The door and frame shall bear an approved label or other identification showing the rating thereof, the name of the manufacturer and the identification of the service conducting the inspection of materials and workmanship at the factory during fabrication and assembly.

Smoke- and draft-control door assemblies shall be provided with a gasket so installed as to provide a seal where the door meets the stop on both sides and across the top.

Doors shall be maintained self-closing or shall be automatic closing by actuation of a smoke detector.

Section 1204. Every sleeping room below the fourth story shall have at least one operable window or exterior door approved for emergency escape or rescue.

Section 4201. Requirements for interior finishes shall not apply to materials which are less than 1/8 inch in thickness cemented to the surface of walls or ceilings if these materials have flame spread characteristics no greater than paper of this thickness cemented to a non-combustible backing.
CODE COMPARISON (continued)


7. Interior Finish (continued)

Exception No. 2: The authority having jurisdiction shall include such finishes in the determination of classification in any case where in the opinion of the authority having jurisdiction they are of such character or thickness or so applied as to affect materially the flame spread or smoke development characteristics.

16-3.3.1 (new) Interior finish on walls and ceilings, in accordance with Section 6-5 and subject to the limitations and modifications therein specified, shall be as follows:

Vertical Exits—Class A.
Exit access—Class A or B.
Individual guest rooms and other rooms—Class A, B, or C.

17-3.3.1 (existing) Interior finish on walls and ceilings, in accordance with Section 6-5 and subject to the limitations and modifications therein specified, shall be as follows:

Vertical exits—Class A or B.
Exit access—Class A or B.
Individual guest rooms and other rooms—Class A, B, or C.

16-3.3.2 (new) and
17-3.3.2 (existing)
Interior floor finish in corridors and exitways shall be Class I or Class II in accordance with Section 6-5.

8. Illumination, Emergency Lighting, Exit Signs**

16-2.8.1 (new) and
17-2.8.1 (existing)
Each public space, hallway, stairway, or other means of egress shall have illumination in accordance with Section 5-8. Access to exits shall be continuously illuminated at all times.

16-2.9.1 (new) and
17-2.9.1 (existing)
Any hotel with 26 or more rooms shall have emergency lighting in accordance with Section 5-9.

1982 Uniform Building Code

Section 4204(a) General. The maximum flame-spread classification of finish materials used on interior walls and ceilings shall not exceed that set forth in Table No. 42-B, i.e.:

Unenclosed Vertical Exits—Class II
Corridors—Class II.
Individual Guests Rooms—Class III (See Note 2.)

Section 3313(a) General . . . exits shall be illuminated at any time the building is occupied with light having intensity of not less than 1 foot-candle at floor level . . .

Section 3313(b) Power Supply.
2. Separate source of power. The power supply for exit illumination shall normally be provided by the premises wiring system. In the event of its failure, illumination shall be automatically provided from an emergency system where the occupant load served by the exiting system exceeds one hundred in Group R, Division I occupancies having an interior exit corridor system.

Note 2: NFPA interior finish Classes A, B, and C are identical to UBC Classes I, II, and III, respectively.

** These are not significant factors because all reported escapes were by way of broken-out guest-room windows and all fatalities occurred within the guest rooms.
8. Illumination, Emergency Lighting, Exit Signs (continued)

16-2.10.1 (new) and
17-2.10.1 (existing)
Every exit access door from public hallways or corridors on floors with sleeping accommodations shall have an illuminated sign in accordance with Section 5-10. Where exits are not visible in a hallway or corridor, illuminated directional signs shall be provided to indicate the direction to exits.

Section 3314(a) Where Required. Exit signs shall be installed . . . when the exit serves an occupant load of 50 or more.

Section 3314(d) Power Supply.
2. Separate sources of power. When separate sources of power are required for exit illumination by Section 3313(b)/2, power to one of the lamps for exit signs shall be from storage batteries or an on-site generator set . . .

Summary

The combination of: 1) the combustible loading in the corridor system provided by the stored rolls of carpet and padding; 2) the intense smoke generated by the burning carpet and padding; 3) the unprotected vertical openings created by the open interior stairways; 4) delayed detection of the fire; and 5) the absence of any type of alarm system for notifying building occupants were the major factors contributing to loss of life in this fire. The high smoke production of the burning stored, rolled carpet and padding provided a very heavy smoke condition early in the fire development, creating untenable conditions in the exit access corridors. The three open interior stairways, particularly the stairway at the west end (where the fire originated), allowed products of combustion and fire to spread rapidly to the second-floor corridor.

The following are significant additional findings of the NFPA investigative study: 1) the lack of detection and extinguishment in the incipient state of the fire; 2) the presence of fixed guest-room windows; 3) the arrangement and installation of guest-room doors and framing; and 4) the lack of an automatic sprinkler system to control the fire in its incipient stage.

The hotel security guard reported discovering the fire between 3:00 and 3:15 am; however, the Fort Worth Fire Department received first notification of the fire at 3:22 am. The fire was well advanced when fire fighters arrived. The fixed guest-room windows forced occupants to break out the glass before they could escape. Many guests reported that repeated attempts were necessary to break the thick glass windows. This added to the delay in escaping and to the number of laceration-type injuries.

The guest-room door framing, described earlier, did not provide an adequate barrier to prevent heat and smoke spread into guest rooms. Further, because guest-room doors were not equipped with self-closing devices, many doors remained open after the occupants left their rooms to examine the exit access corridors. The voiding of this fire barrier, in addition to the vertical voids mentioned earlier, allowed the magnitude of the fire to reach a point where it could be (and was not) easily extinguished by manual fire suppression techniques. Complete automatic sprinkler protection would have intervened before the fire reached this critical level.

Factors that helped limit further loss of life and injuries were: 1) the alerting efforts of hotel personnel who used car horns as an alarm, telephoned guest rooms, and used a crowbar to break open glass windows; 2) the rescue efforts of the first-arriving companies of the Fort Worth Fire Department; and 3) the compartmentation of the individual guest rooms, which was adequate during the early stages of the fire, i.e., until guests were able to escape or were rescued. Doors that were kept closed provided extra time for rescue by the limited manpower of initially responding emergency forces. However, as mentioned earlier, door position and arrangement ultimately did affect fire and smoke spread. Subsequent rehabilitation and treatment (triage) efforts assisted the injured.

This fire again illustrates common problems associated with hotel fires. In two recent fires — a hotel fire on November 26, 1978 that claimed 10 lives in Greece, New York, and another on July 31, 1979 that resulted in 10 fatalities in Cambridge, Ohio — primary factors that led to the fatalities were similar to those in the Ramada Inn Central fire discussed here — including unpro-
ected vertical openings and inadequate alerting of the occupants.

All three fires demonstrate that once the exit access becomes untenable, the means of egress system is unusable for escape. The exit access corridors became untenable early in the fire development at the Ramada Inn Central. This forced occupants to use the exterior windows as a secondary means of escape. These were not emergency escape-and-rescue openings and, as a result, people were delayed and received injuries. None of the occupants actually “sat the fire out” in their rooms. Guest-room doors and construction provided only a limited degree of compartmentation.

Although the installation of automatic sprinklers would be required in this hotel building by either NFPA 101, the Life Safety Code, or the Uniform Building Code, sprinklers probably would have affected the outcome of this fire. The life-safety record in similar facilities protected by complete automatic sprinkler systems is excellent. A typical “Light Hazard” sprinkler system (as defined by NFPA 13, Installation of Sprinkler Systems) installed in the hotel corridor could have been challenged by the unusual combustible loading created by the stored carpet and padding. However, the stored carpet and padding (as contrasted with a warehouse situation, for example) were limited to the west end of the corridor and the rest of the corridor system contained only typical wall and floor coverings. Thus, the challenge to a “Light Hazard” sprinkler system would likely have been localized and the fire would have been controlled during the incipient stage, preventing the severe fire and smoke spread that occurred in this incident. Control of this fire by a sprinkler system during the incipient stage is a plausible scenario.

The requirements contained in NFPA 101-1981, the Life Safety Code, the 1982 edition of the Uniform Building Code, and other firesafety codes and laws are intended to mitigate multiple-fatality incidents such as the Ramada Inn fire.

On June 30, 1983, the state of Texas enacted a law, effective January 1984, requiring the installation of smoke detectors in all new and existing hotel guest rooms.

The NFPA was assisted in data collection and analysis by the International Conference of Building Officials (ICBO), under an agreement between the NFPA and the three model building code organizations to investigate serious structural fires throughout the United States. In addition to the ICBO, the other cooperating building code groups are the Building Officials and Code Administrators International (BOCA) and the Southern Building Code Congress International (SBCCI). The three model building code groups are supporting the NFPA by lending technical staff support for on-site field work and code analysis. This report is another of the NFPA's studies of fires that have particularly important educational or technical interest. The information presented is based on the best data available to the investigators immediately after the fire and that obtained during subsequent follow-up.

It is not the NFPA's intention that this report pass judgment on, or fix liability for, the loss of life and property at the Ramada Inn.

This report describes firesafety conditions at the Ramada Inn and presents findings on factors contributing to the loss of life based on NFPA analysis of collected data and observations during the investigation. NFPA codes and standards and ICBO building code were used as criteria for this analysis so that conditions at the Ramada Inn on the day of the fire could be compared with current fire protection practices. It is recognized that these codes and standards may not have been in effect during construction or operation of the hotel. The NFPA has not analyzed the hotel as to compliance with the codes and standards that were in existence when the Inn was built or during its operation.

The cooperation and assistance of Chief Larry McMillen, Deputy Chief Don Peacock, and District Chief Chester Robinson of the Fort Worth Fire Department are greatly appreciated.

Photograph on page 55 is from the Fort Worth Star-Telegram.

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