MGM Grand Hotel fire

Las Vegas, Nevada

(1980)

Second most deadly hotel fire in United States history led to a nationwide reevaluation of fire codes.

Background

Sparks from a short-circuit started a fire in the MGM Grand Hotel in Las Vegas, Nevada on November 21, 1980. Despite having passed inspections, the building's fire protection systems could not prevent the fire from engulfing the world's largest gambling hall in smoke and flames. Thick black smoke filled the air ducts and escape stairwells in the twenty-one floors of guest rooms. Scenes reminiscent of Hollywood disaster films became reality as guests were awakened by screams and smoke. Some raced to the roof or ran down smoke-filled stairwells. Others called for help or huddled by broken windows as smoke billowed into their rooms. Eighty-five people died and over six hundred were injured, primarily due to smoke inhalation rather than the fire itself. The disaster dramatically accelerated the updating of fire code regulations for both new and existing high-rise buildings.

The MGM Grand Hotel is an enormous facility, including a casino, two 1,000-seat theaters, forty shops, five restaurants, 2,076 guest rooms, a jai alai fronton, and a sports arena. A "T" shaped tower of guest rooms rises above two entertainment levels, each as large as twenty football fields. The fire and its impact were concentrated near the casino on the upper entertainment level and in the guest tower. Of the fire protection systems designed and built into the MGM Grand, the four most important during the fire were the building egress system, the fire suppression and alarm system, the system of fire zones, and the heating, ventilation and air conditioning (HVAC) system.

The hotel's building egress system was intended to provide safe routes of passage out of the building to safety. People in the casino and adjacent spaces could exit the building directly onto the street through several large sets of doors. Hotel guests could exit through one of the two stairwells in each of the three branches of the T-shaped guest tower.

The fire suppression and alarm system was designed to detect and control a fire. The fire suppression system was based on automatic water sprinklers located in selected portions of the building; the heat of a fire would set off these sprinklers. The minimum guidelines of the fire code in effect at the time of hotel's design did not require that the entire facility be equipped with sprinklers. Thus, the casino, deli, most floors in the guest tower, and many other areas were not protected by sprinklers. An especially important area that was not protected was the casino's "eye in the sky." This network of walkways above the casino's ceiling allowed security personnel to monitor gambling operations unnoticed. The alarm system was designed to alert the hotel's security office of an outbreak of fire. The security office would then verify the alarm and use the building's alarms and public address systems to alert occupants to any danger.

A system of fire zones isolated distinct sections of the hotel and casino facility to prevent the spread of fire and smoke and to protect occupants and property. Fire zones are formed by enclosing parts of a building with fire-resistant construction. These enclosures must effectively seal off the many openings between building parts and any gaps between construction materials through which fire and smoke could pass. Important openings in fire zone enclosures at the hotel include access panels into elevator and air shafts, structural joints for building movement, and the junctures of structural steel and drywall.

The heating, ventilation, and air conditioning (HVAC) system at the hotel was designed to stop the flow of air into the building during a fire. Fire dampers—hinged louvers similar to those on attic exhaust fans in many residences—are fundamental to this strategy. The fire dampers in large HVAC systems are typically installed where air crosses fire zone enclosures and adjacent to air distribution fans. Fire dampers are usually held open by a link designed to melt in the heat of a fire, thereby closing the louvers and stopping the flow of air. In this way, fire dampers allow the passage of air through the building under normal circumstances while maintaining the integrity of fire zone enclosures.

Three factors caused the fire protection systems at the MGM Grand Hotel to perform poorly during the November 21 fire: the original construction did not fulfill the intent of the designers; the contents of the casino level were unusually dangerous in a fire; physical and operational modifications since the opening of the hotel had reduced the effectiveness of the fire protection systems.

The construction deficiencies impaired the building's ability to suppress a fire. Potential smoke paths across fire zone enclosures were left open, or were covered with materials that could not resist fire or stop smoke. Moreover, materials with inadequate flame-spread and smoke ratings were used to build ceilings and attic areas, and the elevator shafts were not adequately vented. The decorations, furnishings, and finishes on the casino level contained high amounts of synthetic materials. These materials can easily catch fire and burn, and produce large amounts of smoke. Some fire dampers

had been bolted open or had their "melt-down" links replaced with metal wire, preventing the dampers from functioning. In addition, several areas designed for 24-hour use—spaces where the fire code did not require sprinklers, on the assumption that any fire would be detected quickly—were in fact closed down during low-use periods. One such area was the deli, where the fire started.

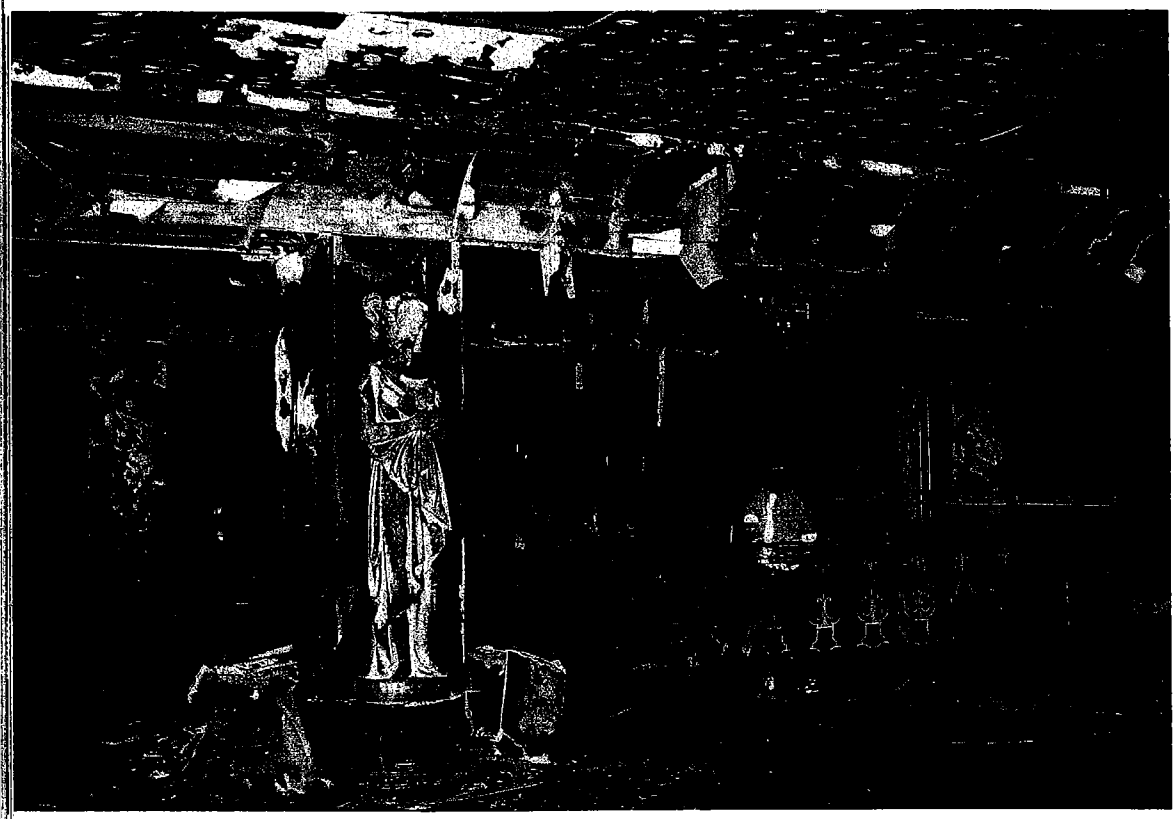
The MGM Grand Hotel was thus a facility whose faulty and inadequate fire protection systems had been crippled by modifications. Despite the numerous flaws in its fire protection systems, the hotel was not in gross violation of the fire design and construction standards that prevailed at the time. The building underwent all required fire reviews and inspections before opening, and passed a fire inspection just six months before the disastrous fire.

Details of the Fire

About 7:10 A.M. on November 21, 1980, an MGM Grand Hotel employee noticed sparks coming out of a gaming board in the closed-down deli. A chef tried to extinguish the fire, but soon was forced to flee the area. The fire fed on fresh air supplied by the HVAC system and the abundant combustible materials, generating smoke that was laden with unburned fuels. These flammable gases collected in the "eye in the sky" above the casino, and were infiltrating the casino space itself as the fire department entered. Fire fighters later reported that they noticed a stratified layer of smoke six to eight feet from the ceiling. Within approximately twelve seconds, the smoke had dropped to four feet above the floor, as the fire threw open the glass doors at the west end of the hotel and took on the appearance of a fire storm.

The inadequacies in the hotel's fire protection systems aided the progress of the fire. The fire incapacitated the alarm system, preventing those in the tower from receiving any warning. The fire zone enclosures failed, allowing smoke to enter the hotel's air ducts, elevator shafts and stairways and migrate throughout the building. The HVAC system, rather than depriving the fire of oxygen, provided it with fresh air. The chimney effect created by the vertical passageways and the HVAC system drew the smoke quickly up into the guest tower hallways and rooms. The building egress system, however, proved to be the most deadly factor. The only path of exit from the guest rooms was down the stairwells to the street. Once hotel guests entered these stairwells, self-locking doors prevented them from returning to the hallways. Thus, as smoke filled the stairwells, many guests became trapped. Only the automatic sprinkler system performed as designed, preventing the fire from spreading into the guest tower or beyond the casino-level areas that were not equipped with sprinklers.

Most of the guests and employees on the casino level were able to flee out of the building ahead of the fire. Some guests in the hotel tower, rather than attempting to evacuate down the stairwells, escaped to the roof. Many other guests remained in their rooms and broke or opened windows to gain access to fresh air. The fire department was able to control the fire by around 8:30 A.M., and evacuated the majority of the survivors by 11:00 A.M.



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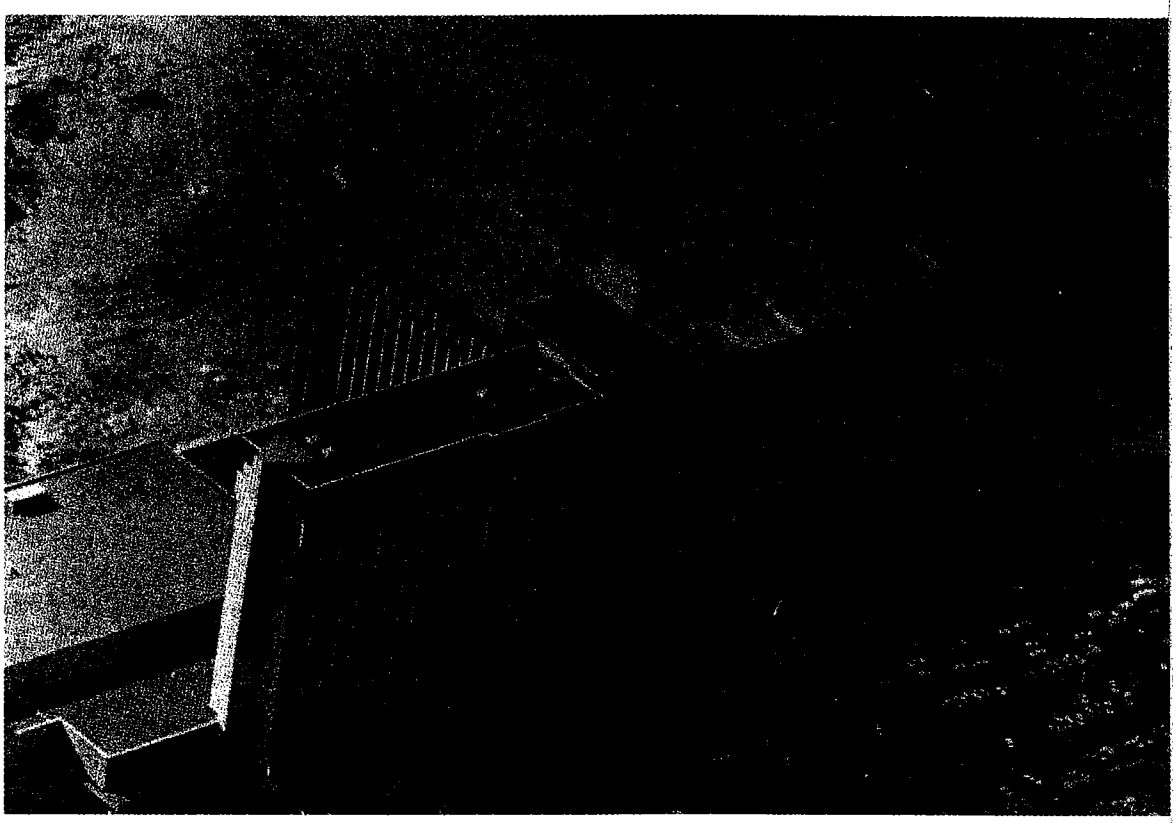
Impact

The most important impact of the MGM Grand Hotel disaster was the nationwide revision of local fire codes. The fire brought two issues to the forefront of fire code discussions: (1) the danger of smoke over and above that of fire, and (2) the failure of fire protection systems to evolve with fire protection capabilities.

Given that over ninety percent of those who died in the disaster were overcome by smoke rather than fire, several communities increased the emphasis on smoke control in their fire protection regulations. These changes represented a shift in priorities from saving buildings to saving lives. Smoke detectors were developed that would signal the HVAC system to exhaust air out of a fire area and pressurize the surrounding spaces to contain the circulation of the smoke. Although fire protection professionals are not in complete agreement over the feasibility of all smoke control methods, many cities now require that all high-rise buildings be equipped with smoke control systems.

Fire-protection systems in buildings fail to evolve with fire protection capabilities for two reasons: the continuous improvement of fire protection



Helicopters were used to rescue nearly 1,000 people from the fast-moving MGM Grand Hotel fire.

knowledge and technologies, and the long life of buildings. In the eight years between the design and construction of the MGM Grand Hotel and the November 21 fire, for example, the following advances in fire protection for high-rise buildings were incorporated into local fire codes: smoke detectors, refuge centers, direct connection of fire alarms to fire departments, communication systems for use by firefighters during a fire, and smoke exhaust systems. Thus, the extended life-span of buildings causes many facilities to remain in use long after their fire protection systems are outdated.

Fire codes can require existing buildings to be upgraded to comply with newly adopted guidelines, but such retroactive codes, while increasing safety, carry large costs for building owners and communities. The higher cost of "retrofitting" and operating high-rise buildings can ultimately reduce the attractiveness of a city to developers and businesses. In 1980, few fire codes were retroactive. Since the MGM Grand fire, several cities have adopted retroactive codes. The legality of several of these fire code provisions has been challenged in court.

Nonetheless, the MGM Grand Hotel fire illustrates how a technological disaster can act as a catalyst for societal change. Such disasters often lead to a reevaluation of the relative values placed upon different aspects of the community—human life, buildings and facilities, the prospect of economic expansion. The nation's second most deadly hotel fire provoked a flurry of discussion about alternative approaches to and priorities within fire protection. The fire code reforms that resulted point to the large-scale political significance of the MGM Grand Hotel disaster.

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Where to Learn More

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