



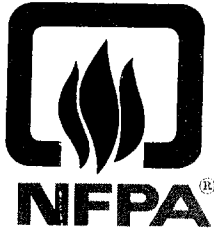
MALL FIRE
Denver, Colorado
November 23, 1983



FIRE INVESTIGATIONS

NATIONAL FIRE PROTECTION ASSOCIATION

1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101 USA
Telephone: 1-617-984-7263 E-mail: investigations@nfpa.org



"Moving Mankind Toward Safety From Fire"

NATIONAL
FIRE PROTECTION
ASSOCIATION
INTERNATIONAL

Investigation Report

Shopping Center Fire
University Hills Mall
Denver, Colorado
November 23, 1983

Prepared by

Richard L. Best
Senior Fire Analysis Specialist
National Fire Protection Association

In Cooperation with

Federal Emergency Management Agency/
United States Fire Administration

and

National Bureau of Standards/
Center for Fire Research

Note: The photograph referenced in the text is not included in the .pdf file.

The substance of this investigation report is dedicated to the public. It may be freely reprinted with the customary crediting of the source. The author and publisher are solely responsible for the accuracy of statements or interpretations contained herein.

INTRODUCTION

The National Fire Protection Association (NFPA), with assistance from the International Conference of Building Officials (ICBO), investigated the University Hills Mall fire in order to document and analyze significant factors that resulted in the major property loss. This study was conducted under a major fires investigation agreement with the Federal Emergency Management Agency/United States Fire Administration (FEMA/USFA) and the National Bureau of Standards/Center for Fire Research (NBS/CFR).

The agreement, funded by all three organizations, provides for the investigation of technically significant fires by the NFPA Fire Investigations and Applied Research Division to document and analyze incident details and report lessons learned for loss prevention purposes. 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.

This report is another of NFPA's studies of fires having important educational, and/or technical value. The information developed is based on the best data available immediately following the fire and additional data obtained in subsequent follow-up.

The cooperation and assistance of Fire Chief Myrle Wise, Fire Prevention Captain Tom Abbott, and Fire Investigation Division Captain James D. Persichitte of the Denver Fire Department is acknowledged and appreciated. Special thanks to Mr. William D. Wall, P.E., Regional Engineer, Midwest Regional Office, (ICBO) for his on-site assistance and for his input into the code analysis and the report writing process.

ABSTRACT

A difficult five-alarm fire caused approximately \$15 million damage to the University Hills Mall on November 23, 1983. The large shopping center located in Denver, Colorado was originally an open-air shopping center outside the city limits. The University Hills Mall was within the city limits when a construction project was completed enclosing the space between the original buildings which created the Mall.

Neither sprinkler protection nor fire walls were required in the single-story commercial structure. Sprinkler protection was provided in the Mall when the shopping center was enclosed. Sprinklers were installed at the ceiling level of the Mall and a line of sprinklers was installed inside each store bordering the mall. The May-D & F store was sprinklered.

A fire caused by an electrical malfunction within a concealed space above Yarbrow Drug Store was detected by a burglar alarm at 12:22 a.m. The fire spread unrestricted in a southerly direction through the concealed attic spaces below the roof and above suspended ceilings. The fire was brought under control at approximately 6:00 a.m. One hundred twenty fire fighters at the scene manned 14 engines, 8 pieces of aerial apparatus and 17 other miscellaneous pieces of equipment.

Damage was estimated at \$15 million. Thirteen stores were destroyed, 19 others were damaged by smoke, heat, and water. There was some roof collapse in the area of Yarbrow Drug, where the fire started. It is likely that the sprinkler protection in the Mall helped to limit the spread of fire.

BACKGROUND

The University Hills Mall is located on the south side of Denver. It first opened as a smaller open-air shopping center with seven stores in 1951. Eleven more stores were opened in January, 1952. A four-story May Company store (May-D & F) opened in 1956. In November, 1975, a \$1 million project was completed, enclosing stores and shops in the three existing wings. When the buildings were constructed, fire walls, sprinkler or automatic alarm systems were not required in the single-story commercial structure as additions were constructed. There were approximately 44 businesses in the Mall at the time of the fire.

The Mall, totaling approximately 300,000 square feet (excluding the upper floors of the May-D & F Store), consisted of essentially three separate buildings connected by the Mall.

Since the buildings were initially located in the county which was without authority to enforce building regulations, the exact phasing of the development is unknown. The following materials of construction are based on field investigation.

The west building (Tenant areas 1-12) most nearly resembles Type III-N construction under the current Uniform Building Code and Type III-200 according to NFPA 220-1979 standard on types of building construction. It consisted of masonry exterior walls with steel trusses at four foot centers supporting two-inch nominal tongue and groove decking with a built-up roof covering. There were some interior masonry walls, parallel to the roof trusses but they did not extend to the underneath side roof deck, just to the bottom of the trusses. Some other interior partitions were gypsum covered wood studs which did not extend above the trusses. It appears that tenant areas 13 through 15 were added subsequent to the construction noted above.

These tenant areas had the same construction as above except they had a reinforced gypsum-like deck. The deck was formed by some type of combustible material that remained in place.

The concealed spaces were created by extensive wood furring covered by 12-inch square tiles adhesively applied. Below that in some cases was a lay-in acoustical ceiling sometimes furred with wood members. These two furrings, plus the combustible roof decking, actually caused three different levels of combustibles for the fire to feed on.

The width of the Mall was approximately forty feet with some areas necking down to twenty-seven feet.

The north building containing Ace Hardware, Dave Cook, etc. was not examined for type of construction.

The permit for the May-D & F Store states Type I construction. This was not examined in the field. The permit for the Mall itself stated Type III-N sprinklered. This was verified in the field.

When the Mall was enclosed (then within city limits), sprinkler protection was provided in the Mall area and a line of sprinklers was installed inside each store that bordered the Mall. The May-D & F Store was provided with an automatic sprinkler system, however, the other stores and shops were not fully sprinklered and concealed spaces above the ceilings were not sprinklered. As many as three separate concealed spaces existed in some areas. There were no fire stops or draft stops within the extensive concealed spaces.

Public Protection

The Denver Fire Department has over 900 civil service members with over 700 personnel in fire suppression located in 28 stations.

Weather Conditions

At the time of the fire on Wednesday morning, the temperature in Denver was 11 or 12⁰F and dropped to 8⁰F by 6:00 a.m.

THE FIRE

The first notification of a fire at the University Hills Mall was from a burglar alarm in Yarbrow Drug at 12:22 a.m. Police responded and discovered a fire at the ceiling level of the drug store and that ceiling tiles were falling. The fire department was notified at 12:25 a.m. The lieutenant of the first engine company to reach the scene stated that there was no fire visible as the engine approached the shopping center. Even from the parking lot there was no fire or smoke visible. He reported there was some smoke in the area as he got off the apparatus, but still there was no fire visible, just a red glow could be seen inside Yarbrow Drug through a window.

Fire fighters made forcible entry and advanced a 1 3/4 inch handline into the drug store. The lieutenant reported that the fire was definitely in the roof. There was fire above and on both sides of the fire fighters. They held their ground for several minutes before being forced out. Other companies were coming in as the first-in crews were backing out.

A special alarm at 12:31 was followed by a second alarm at 12:40 which brought in the department chief. Chief Wise authorized a third alarm at 1:00 a.m. as he was enroute to the fire.

A deputy chief checked the alley behind Yarbrow Drug and then along the south side of the shopping center. He noted smoke showing in many areas, all the way across the shopping center to the east as far as the May-D & F Department Store. It appeared that fire had also entered the May-D & F Store.

Skylights above the Mall were opened for ventilation and apparatus was connected to pump into the fire department connection. Fire fighters had difficulty locating the fire. Additional ventilation openings were made on the roofs southeast of the drug store. Crews worked along those stores opening ceilings. They found some fire about three stores away from the drug

store. In other stores where there was a lot of smoke and fire fighters expected to find fire, there was none.

Other companies advanced a large diameter hose line through the Mall from the south entrance. Sprinklers at the ceiling level at the west end of the Mall activated. The sprinkler protection plus the fire suppression efforts of the fire department effectively stopped any fire spread along the Mall stores or from spreading to stores across the Mall.

The fire went to five alarms, a first in Denver fire history. The fire spread unrestricted from the Yarbros Drug Store to the east and south sides through the concealed attic spaces below the roof and above suspended ceilings. The fire was brought under control at approximately 6:00 a.m. One hundred twenty fire fighters at the scene manned 14 engines, 8 aerial apparatus and 17 other miscellaneous pieces of equipment.

Damage

There was no loss of life resulting from this fire. Damage was estimated at \$15 million. The major fire damage was to stores within the group of stores and tenant spaces south of the main mall. Thirteen stores were destroyed, nineteen others were damaged by smoke, heat, and water including the May-D & F Store. There was some roof collapse in the area of Yarbros Drug, where the fire started. (See Photo 1.) Steel trusses, columns and beams reached temperatures which caused partial collapse. Even columns embedded in 8-inch concrete block walls reached sufficient temperature to cause failure.

The large block of stores and shops north of the Mall was not seriously damaged. There was smoke and water damage to stores bordering the Mall, but other stores received only light smoke damage. Most of those stores north of the Mall were back in operation a few days after the fire.

ANALYSIS

The investigation into the cause of the fire continued for several weeks following the fire. The final fire department determination of cause was not released at the time this report was prepared. Fire Investigation Division personnel reported unofficial preliminary findings that indicated the cause was electrical in nature, originating in a concealed space above the drug store between an old ceiling and a new suspended ceiling.

Code Analysis

Due to the fact that a large part of the building was constructed without the benefit of building regulations and that there were no lives lost, only a brief code discussion is presented.

To comply with the 1982 Building Code, installation of draft stops would be required. This would have subdivided the attic into areas of greater than 3000 square feet or 60 feet in any direction. The result would have greatly enhanced the fire department's effort to locate and extinguish the fire more rapidly.

The west and north buildings probably were non-conforming when a building code was adopted for the area. The May-D & F Store was built with the benefit of building regulations. Under the 1982 Uniform Building Code, Section 104 (b) requires that: "Any building plus new additions shall not exceed the height, number of stories and area specified for new buildings." Similar provisions are contained within the Life Safety Code®, NFPA 101-1981, but specify that alterations shall not diminish the level of life safety below that which exists prior to the alteration.* The intention of the codes is to prohibit a non-conforming situation to become more non-conforming. Thus, the enclosure could only be constructed after the entire complex complied as

*See Section 1-4.3; 1-4.4 and 1-4.5.

required for a new building. The building was greatly oversized for its type of construction.

Discussion

The performance of the partial sprinkler protection in the University Hills Mall is difficult to assess. It is likely that the sprinklers and spatial separation helped to limit the spread of fire across the Mall to stores on the north side. The fire suppression efforts of the fire department was also significant in containing the fire to the south area of the shopping center.

There were no sprinklers in the concealed spaces above the drug store where the fire was well entrenched. It has been proven numerous times that partial sprinkler protection is not effective against fires originating in unsprinklered areas of a building. One such fire was reported in The Sentinel* in 1983. A two-story enclosed mall had two large anchor stores at either end, connected by more than 100 smaller stores. Only three of the stores were sprinklered. A fire that began in a lighted display window in one of the smaller ground floor stores, was eventually brought under control five and a half hours later. Eleven stores caught fire and another 32 were damaged. Smoke and water spread through the entire Mall. The damage was \$10 million.

The Sentinel report concludes with an observation that "a sprinkler system in the display window could have kept the fire from spreading beyond the store of origin. In fact, sprinklers should have been installed in every store and throughout the entire mall".

*"A Case in Point", The Sentinel, Industrial Risk Insurers, Third Quarter, 1983.

Another recent shopping center fire that occurred just a few months before the Denver fire resulted in an \$11 million loss. That shopping center in Brunswick, GA, the Brunswick Mall*, was of unprotected noncombustible construction in tenant store areas with a mall of heavy timber construction. The shopping center had no fire protection systems or construction features designed to limit the spread of fire. The fire, on September 20, 1983, started when the shopping center was unoccupied. It caused total destruction to about two-thirds of the structure with smoke, heat, and water damage to remaining stores. Total damage to the Brunswick Mall was estimated to be \$7-8 million to the building and \$4 million to contents.

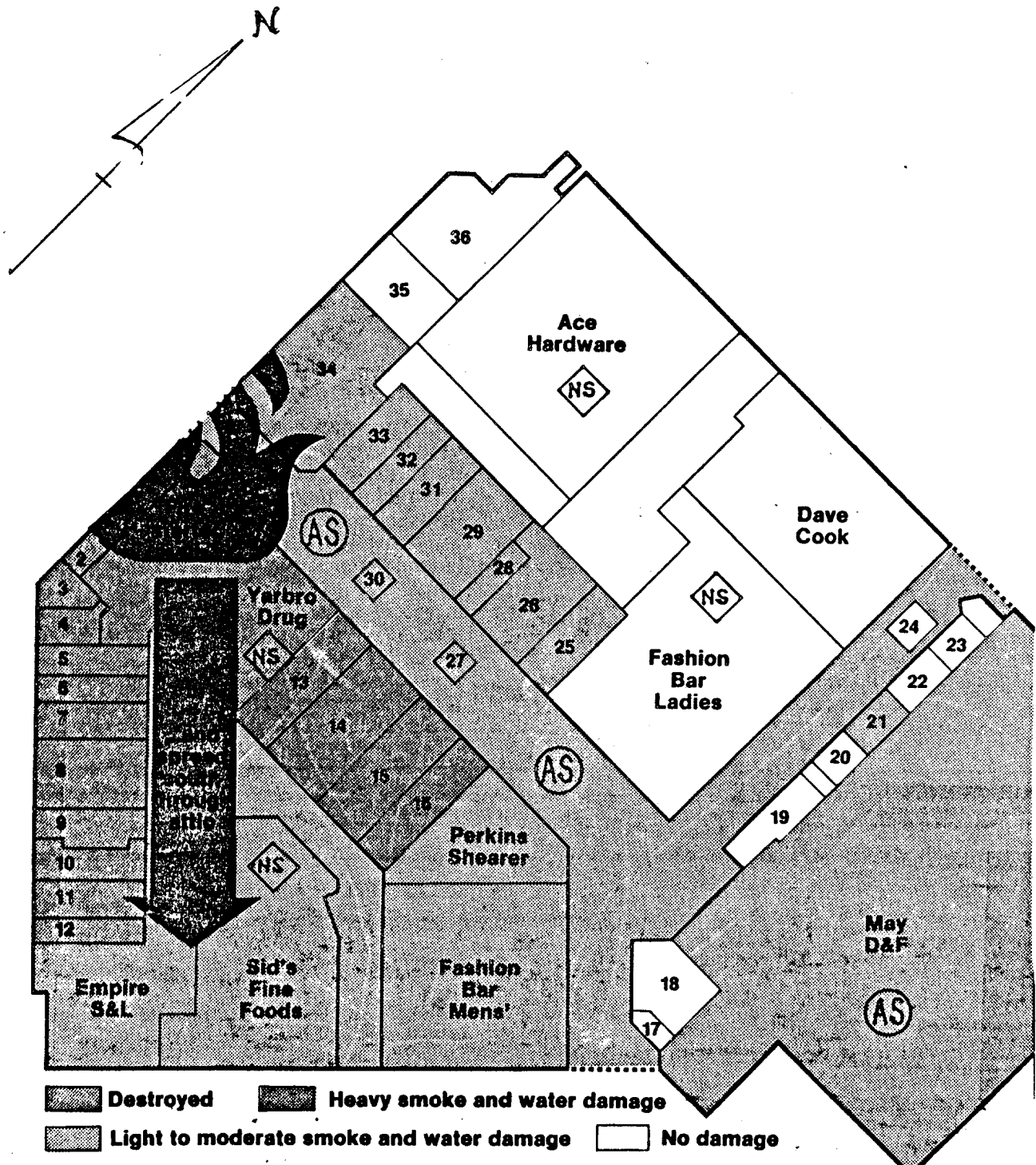
Summary

A statement in the Fifteenth Edition of NFPA's Fire Protection Handbook** may best summarize these recent shopping center fires and the University Hills Mall fire. The statement is contained in the chapter, "Fire Experience and Fire Protection" under the heading "Old Lessons":

A random selection of significant fire losses in industrial and commercial properties reported to NFPA would illustrate many classic, frequently repeated, fire protection lessons: no sprinklers, sprinklers inadequate for the fire hazard, sprinkler system shutdown, absence of adequate fire divisions, violations of fire codes, etc. There is no mystery about the principles necessary to reduce much of the national fire loss. The old lessons in the fire record simply need careful study and application.

*Investigation Report, Shopping Center Fire, Brunswick Mall, Brunswick, GA, September 20, 1983, NFPA.

**Fire Protection Handbook, Fifteenth Edition, National Fire Protection Association, Quincy, MA, 1981.



- | | | | |
|---------------------------------|---------------------------|-------------------------------|--------------------------------|
| 1. Gretschel's Fine Shoes | 10. Dependable Cleaners | 19. Fifth Avenue West | 28. Bensons Opticians |
| 2. A-1 Tours and Travel | 11. Foto-tek | 20. Orange Julius | 29. Mill End Shops |
| 3. Weis Florist | 12. Rainbow Ice Cream | 21. Evan-Lewis Galleries | 30. The Eyes Have It |
| 4. Archer studios | 13. Fashion Bar The Stage | 22. Burt's World of Nutrition | 31. Maternity Mode |
| 5. University Hills Barber Shop | 14. The Boys Store | 23. Mila's | 32. Phelps Shoe Service |
| 6. Michelle Hair and Skin Care | 15. Gleason's Casual Shop | 24. PBP | 33. BJ's Music Box Ltd. |
| 7. University Hills Liquors | 16. Fashion Bar Young Set | 25. Molberg's Jeweler | 34. Hatch's Books |
| 8. Pefferoni's Pizza | 17. Key-Rite Lock and Key | 26. Couche's Shoes | 35. Geiselhardt's Delicatessen |
| 9. The Engraving Place | 18. Morris Alpert | 27. The Engraving Place | 36. Child's Pastry Shop |

Figure 1. Site Plan