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SUMMARY
NFPA FIRE INVESTIGATION REPORT
BULK RETAIL STORE FIRE
TEMPE, ARIZONA
MARCH 19, 1998

1. **Building Description.** One story, reinforced masonry structure measuring 400 ft by 250 ft and ranged from 24 ft to 29 ft high. This resulted in an area of 100,000 ft^2. The roof was supported by lightweight, parallel chord, wood trusses measuring 4 feet deep. . . . . The roof assembly consisted of 4 ft x 8 ft panels constructed of ½ inch. plywood resting on 2 in. x 6 in. wooden supports. The building was constructed in 1988. (Pages 1 and 2, NFPA Fire Investigation Report)

2. **Sprinkler System Design.** The building was equipped with three ceiling level, wet sprinkler systems. The systems were designed to provided water at a density of 0.495 gpm/ft^2 over 2,000 ft^2 and were designed to protect a Class IV commodity for a maximum storage height of 20 ft. The maximum number of sprinkler that it was designed for was 29 sprinklers operating simultaneously. The upright sprinklers were equipped with 286F fusible elements and with 17/32 in. diameter [large orifice] orifices. (Page 2, NFPA Fire Investigation Report)

3. **Fire Location.** Investigators from the Tempe Fire Department determined that the area of origin was in a rack that contained lawn furniture seat cushions. The cause was determined to be incendiary and was started by someone using a point-and-click type of lighter to ignite the seat cushions.

4. According to eyewitness testimony, when the fire was first observed it was located approximately chest hieght on one side of a 12 ft high double-row rack.

   (Page 1, NFPA Fire Investigation Report)

5. **Smoke Conditions On Arrival of the Fire Department.** Upon arrival, they (Phoenix Fire Department) made entry in through the northeast door, advancing a handline. They reported that smoke had fillled the building from floor to ceiling and that visibility was zero. (Page 1, NFPA Fire Investigation)

6. **Roof Vents.** A ladder company was assigned to ventilate the roof. When they reached the area over the fire, they reported that one skylight had burned through and that three automatic roof vents had opened. They proceeded to open approximately 42 more, either by popping them open with an axe or sawing through the fiberglass panels. (Page 2, NFPA Fire Investigation Report)

7. **Sprinkler Operation/Fire Damage.** 66 [large orifice] sprinklers were activated over an area of 5,082 ft^2. Fire damage from flame impingement was limited to 1,500 ft^2. The fire destroyed product in the rack of origin for a length of 32 ft and for the full height of the rack. It also spread to the other side of the double-row rack, destroying product over a length of 32 ft and for the full height of the rack.

The fire spread across a 10 ft aisle and ignited the commodity being stored on the shelves in that rack. This commodity was comprised of barbecue gas grill products wrapped in plastic or cardboard material.

(Page 2, NFPA Fire Investigation Report)

8. **Roof Vents/Draft Curtains.** A series of draft curtains were loated throughout the building. They were constructed of sheet metal and measured 78 inches [6 feet, 6 inches] in depth. One draft curtain was located directly over the aisle where the fire occurred.

   There were a total of 93 skylights and 29 automtic, thermal activated roof vents, each measuring 4 ft x 8 ft. The roof vents were equipped with 165°F fusible links.

   (Page 3, NFPA Fire Investigation Report)

9. **Significant Factors.** Based on the NFPA's investigation and analysis of this fire, the following significant factors were considered as having contributed to the loss of property in this incident:

   a. **Commodity Classification/Sprinkler Hydraulic Design Criteria.** At the time the building had been constructed, the sprinkler system was designed for Class IV commodities. However, at the time of the fire, the commodity in the area of origin was predominantly Group A expanded and unexpanded plastics. This commodity would have required a greater ceiling sprinkler density.

   b. **Flue Spaces.** Inadequate transverse flue spaces within the racks.

   c. **Draft Curtains.** Due to the activation profile of the sprinklers, it would appear that the draft curtains effected [affected] which sprinklers opened.

d. **Fusible Links [Temperature} on the Ceiling Vents.** Since the temperature rating on the ceiling vent links was below those of the sprinkler system, the links could possibly have fused prior to sprinkler activation. If the ceiling vents then opened, they would have allowed for the release of heat that could have impacted upon the sprinkler activation profile.

e. **Obstructed Sprinkler Spray Pattern.** The foil on the ceiling insulation became dislodged in may areas during the fire and obstructed the spray patterns on the sprinklers. In one case, the foil was draped completely over a sprinkler.

(Page 4, NFPA Fire Investigation Report)

10. **Fire Loss Estimate.** ". . . . . .the fire was fueled by conventional fuel loads, and overwhelmed the inadequately designed sprinkler system, destroying 96 linear ft of racks and product, and causing six million dollar in damage." (Page , NFPA Fire Investigation Report)

11. **Applicable Building Code.** At the time of construction, [the City of] Tempe was enforcing the 1985 edition of the Uniform Building Code. (Page 11, NFPA Fire Investigation Report)

12. **Roof Vents.** There were 29 automatic ceiling vents located throughout the store. These vents were equipped with 165^{o}F fusible links. During the course of the investigation it was noticed that a number of the roof vents had caulking applied along the edges of the exterior of the translucent panel to create a weather-tight seal.

    In addition to the ceiling vents the roof had 93 skylights. These skylights were similar in design to the ceiling vents, but were not designed to open. They measured 4 ft x 8 ft and were comprised of translucent material.

(Page 15 and 16, NFPA Fire Investigation Report)

13. **Draft Curtain Construction.** This facility was equipped with draft curtains. The ceilign curtains were spaced 96 ft x 80 ft, creating "cells" 7,680 ft^2. The draft curtains were constructed of 26 guage galvanized sheet metal and had a depth of 78 in. This resulted in a total volume of 49,920 ft^3. One draft curtain was located directly over the aisle where the of origin was located. (Page 18, NFPA Fire Investigation Report)??????? Check

14. **Sprinkler Spacing.** The ceiling sprinkler spacing was 8 ft x 9ft-7in, resulting in an are of coverage of 77 ft^2 per sprinkler. (Page 19, NFPA Fire Investigation Report)

15. **Heat Vent Performance.** A skylight directly over the fire had burned out and three heat vents had automatically opened upon fire department arrival. An additional 42 vents and skylights were either manually opened or cut open by the fire department during fire-fighting operations. Fire department personnel reported that a number of ceiling heat vents' thermal elements had fused, but these vents did not open. The heat vents that had not properly operated were forcibly opened by fire fighters. (Page 35, NFPA Fire Investigation Report)

16. **Draft Curtain Performance.** A draft curtain was located directly over the aisle of origin. The rack of origin was located approximately 5 ft to the north of this curtain. A total of 66 ceiling level sprinklers activated in this fire, 52 of which were located to the north of the draft curtain. The fire leapt the aisle, traveling under the draft curtain, and ignited the rack to the south of the draft curtain on fire. Another 12 ceiling-level sprinklers and one column sprinkler activated on the south side of the draft curtain over this second rack. (Page 37, NFPA Fire Investigation Report)

17. **Sprinkler/Vent/Draft Curtain Interaction.** The precise role that the draft curtains and ceiling vents had on the operation of the sprinkler system is unknown. However, the sprinkler protection requirements called for in NFPA documents are not based on the presence of either of these features. (Page 41, NFPA Fire Investigation Report)

18. **Draft Curtain Effects.** Due to the activation profile of the sprinklers, it would appear that the draft curtains had a role in the operation sequence of the sprinklers. The impact they had is a case for further study to determine the value of draft curtains in fire protection scheme. (Page 42, NFPA Fire Investigation Report)

19. **Vent Fusible Link Temperature Rating.** Since the [temperature rating of the] links on the vents were below those of the sprinkler system, they should have opened prior to sprinkler activation. In this case, it was report that a number of the links had fused, but the vents had not opened. This may have occurred because of the weather caulking that had been applied to the translucent panels.

    If the ceiling vents had opened, this would have allowed for the release of heat, impacting the activation profile of the sprinklers. There is some debate over the value of having roof vents operate automatically during a fire as opposed to having the fire department open the vents manually.

    (Page 42, NFPA Fire Investigation Report)

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