FOAMED LATEX AND FLEXIBLE, OPEN-CELL FOAM POLYURETHANE STORAGE

INTRODUCTION

The fire hazard presented by the storage of exposed, foamed latex and exposed, flexible, open-cell, foamed polyurethane is greater than other cellular plastics covered in NFPA 13 such as rigid expanded polyurethane or expanded polystyrene. For this reason, the fire protection outlined in NFPA 13 is not considered adequate for storage of this product. Fire protection guidelines are outlined in this section.

POSITION

Install all sprinkler systems in accordance with NFPA 13 and PRC.12.1.1.0, as modified by this guideline.

Warehouses

Limit storage to one story structures. Keep storage of exposed, foamed latex and exposed, flexible, open-cell, foamed polyurethane in a detached storage facility. When storage is in an attached facility, AXA XL Risk Consulting prefers warehouses of fire resistive roof and column construction. Noncombustible roof construction with columns fireproofed for 4 hr rating is acceptable. Avoid long span light structural steel construction. Provide fire walls having a 4 hr fire rating with double, 3 hr fire doors between manufacturing and storage areas and between storage areas. Provide adequate outside access. Provide powered heat and smoke venting on the basis of 300 cfm (8.5 m^3/min) for each 30 ft^2 (2.8 m^2) of floor area. When ESFR sprinklers are used, arrange the venting to be a manual operation, for all other types of sprinklers arrange for automatic operation. Provide draft curtains, 6 ft (1.8 m) deep, to enclose each 5000 ft^2 (465 m^2) of floor area. (Refer to PRC.2.1.4.)

Palletized, Solid Pile, and Portable Rack and Wire Basket Storage

Limit maximum area per pile to 1200 ft^2 (110 m^2) with a maximum pile width of 25 ft (7.5 m). Maintain minimum 12 ft (3.6 m) wide main aisles, minimum 8 ft (2.5 m) wide cross aisles and minimum 3 ft (1 m) clearance between stock and walls.

For storage to a maximum height of 10 ft (3 m) and maximum building height of 20 ft (6.1 m), provide wet pipe automatic sprinkler protection designed to deliver 0.60 gpm/ft^2 (24.5 L/min/m^2) over the most hydraulically remote 4000 ft^2 (372m^2) using 286°F (141°C) sprinklers.

For storage to a maximum height of 20 ft (6.1 m) and maximum building height of 25 ft (7.6 m), provide protection using pendent K14 ESFR sprinklers with a design of 12 sprinklers operating at 75 psi (5.2 bar).

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Rack Storage

Limit storage to single and double row racks. Maintain minimum 8 ft (2.5 m) wide aisles.

When the clearance between sprinkler and top of storage exceeds 10 ft (3 m), provide a solid barrier above the top of storage with sprinkler protection below the barrier. Storage greater than 10 ft (3 m) requires in-rack sprinkler protection and installation of solid, horizontal barriers at a maximum 10 ft (3 m) interval.

Provide wet pipe automatic sprinkler protection designed as follows:

- Storage heights up to 5 ft (1.5 m): 0.30 gpm/ft^2 (12.2 L/min/m^2) over the most hydraulically remote 3000 ft^2 (279 m^2).
- Storage heights between 5 ft and 10 ft (1.5 m and 3 m): 0.60 gpm/ft^2 (24.5 L/min/m^2) over the most hydraulically remote 4000 ft^2 (372 m^2).
- Storage heights between 10 ft and 25 ft (3 m and 4.5 m): longitudinal flue in-rack sprinklers at the mid point of the total storage height but not to exceed a maximum vertical spacing of 10 ft (3 m) with solid barriers above the in-racks. If the height of storage above the top barrier is 5 ft (1.5 m) or less, the ceiling density should be 0.30 gpm/ft^2 (12.2 L/min/m^2) over the most hydraulically remote 3000 ft^2 (279 m^2). If the height of storage above the top barrier is greater than 5 ft (1.5 m), the ceiling density should be 0.60 gpm/ft^2 (24.5 L/min/m^2) over the most hydraulically remote 4000 ft^2 (372 m^2).
- Storage heights above 25 ft (4.5 m): face in-rack sprinklers at maximum 10 ft (3 m) vertical intervals with solid barriers above. If the height of storage above the top barrier is 5 ft (1.5 m) or less, the ceiling density should be 0.30 gpm/ft^2 (12.2 L/min/m^2) over the most hydraulically remote 3000 ft^2 (279 m^2). If the height of storage above the top barrier is greater than 5 ft (1.5 m), the ceiling density should be 0.60 gpm/ft^2 (24.5 L/min/m^2) over the most hydraulically remote 4000 ft^2 (372 m^2).

Use 286°F (141°C) ceiling sprinklers for storage up to 25 ft (4.5 m) high. If 165°F (74°C) sprinklers are used, increase the area of application by 1000 ft^2 (93 m^2). For storage greater than 25 ft (4.5 m), use 165°F (74°C) sprinklers.

Install quick response, 165°F (74°C), in-rack sprinklers at a maximum 8 ft (2.4 m) horizontal spacing. Design for 8 sprinklers operating at 30 psi (2 bar) when one level is installed, 14 sprinklers (seven on each top two levels) operating at 30 psi (2 bar) when multiple levels are installed.

Storage to a maximum height of 20 ft (6.1 m) and maximum building height of 25 ft (7.6 m), can also be protected using pendent K14 ESFR sprinklers with a design of 12 sprinklers operating at 75 psi (5.2 bar) without the use solid barriers.

Water Supply

Provide a water supply adequate to supply the sprinkler demand plus 1000 gpm (3780 L/min) for hose streams for at least 4 hours.

Manufacturing

The following recommendations apply to the processing and fabrication areas in plants handling exposed, foamed latex and exposed, flexible, open-cell, foamed polyurethane. When the storage is in racks or in cut-off rooms, the fire protection is to be in accordance with the "**WAREHOUSES**" section.

Construction

Where possible, enclose these materials with noncombustible walls or partitions. If partitions are not possible, enclose the area with 6 ft (1.8 m) deep draft curtains. The area enclosed by draft curtains should not exceed 2500 ft^2 (230 m^2). Provide automatic powered heat and smoke venting on the basis of 300 cfm (8.5 m^3/min) for each 20 ft^2 (2.8 m^2) of floor area. (Refer to PRC.2.1.4.)

Keep quantities in production areas to an absolute minimum. In no case should piles exceed 1000 ft^2 (93 m^2) of floor area with 12 ft (3.6 m) aisles on all sides. Depending upon the sprinkler protection provided, pile heights should not exceed 5 ft (1.5 m) or 8 ft (2.4 m).

For 5 ft (1.5 m) maximum piling, provide automatic sprinklers to deliver 0.25 gpm/ft^2 (10.2 L/min/m^2) over the entire curtained area using 286°F (141°C) K8 sprinklers. For 8 ft (2.4 m) maximum piling, provide automatic sprinklers to deliver 0.48 gpm/ft^2 (19.6 L/min/m^2) over the entire curtained area using 286°F (141°C) K11.2 sprinklers.

Water Supplies

Provide a water supply adequate to supply the sprinkler demand plus 1000 gpm (3780 L/min) for hose streams for at least four hours.

DISCUSSION

A number of losses have occurred in the past that will give an indication of the burning characteristics of these materials.

Five thousand pounds (2300 kg) of foamed latex covering an area of 240 ft^2 (22 m^2) were involved in a fire. The building was a large, one-story, plank on steel construction. **One hundred twenty-seven sprinklers fused** even though there was a strong water supply. A delay in starting the manual fire pumps prevented the sprinklers from getting the needed water in the early stages of the fire. Extinguishment was ultimately accomplished by use of hose streams.

One hundred-ten thousand pounds (50,000 kg) of foamed latex in piles 6 ft – 7 ft (1.8 m – 2.1 m) high on the third floor of a ten-story sprinklered, fire-resistive warehouse were involved in fire. Sprinklers apparently had the fire subdued; the control valve was then closed; fire again erupted “with almost explosive violence, driving firemen from the floor and spreading the fire throughout the third floor.” **One hundred forty sprinklers quickly opened, overpowering the water supply and rendering sprinkler protection ineffective**. Fire then jumped to sixth and seventh floors, each containing 110,000 lb (50,000 kg) of foamed latex stored in a similar arrangement. Though some 20,000 gpm (75,600 L/min) were available from a powerful city water supply, the inferno defied all firefighting efforts. In three hours, the entire building from third floor to roof burned out of control. “The rubber burned so fiercely that one fireman stated he directed a 1150 gpm (4347 L/min) high-pressure hose stream in one window on the sixth or seventh floor, which contained burning rubber, for 20 min without being able to detect any appreciable effect on the fire.”

Fifteen thousand pounds (6800 kg) of foamed latex were involved in fire in a very large one-story steel deck building. **One hundred twenty sprinklers fused** but were reported not effective even though two fire pumps operating maintained over 100 psig (689 kPa) on the system during maximum water usage. **Fourteen hose streams were used,** 1400 ft^2 (130 m^2) of steel roof deck and trusses required replacement.

A 68,600 ft^2 (6370 m^2) noncombustible warehouse, used to store automobile seat cushions in paper bags and cardboard cartons, was destroyed. Sprinklers were provided on the basis of 0.30 gpm ft^2 (12.2 L/min/m^2) over 4000 ft^2 (372 m^2). Normal stock height was 14 ft (4.3 m) with good aisles. Due to a strike in the automobile industry, excess inventories were on hand resulting in storage in the aisles and up to a height of 20 ft (6.1 m). In just a few minutes, the warehouse was totally involved and **the fire burned for some 17 hours despite the response of 19 pieces of fire apparatus**.

A fire occurred in an automobile assembly plant. Polyurethane foam seat cushions were stored in a rack 18 ft (5.5 m) high in the cushion buildup area. Sprinklers were provided on an ordinary hazard schedule, 130 ft^2 (12 m^2) per head. **Two hundred sprinklers operated**. There was significant twisting of trusses, columns, and purlins in an area about 100 ft by 100 ft (30.5 m by 30.5 m). The loss was about $1.5 million.