HANGING GARMENTS

INTRODUCTION

Within the garment industry, items such as suits, jackets, dresses and athletic outfits are stored on coat hangers on fixed pipe racks or movable conveyor type racks. In many instances, the hanging garments are covered with light polyethylene film bags. Loss experience has demonstrated that storage areas that contain arrays of this nature are exceedingly susceptible to contamination from smoke, soot, other products of combustion and water from fire fighting. Large scale fire tests have shown that fires in arrays higher than 12 ft (3.7 m) may be uncontrollable unless horizontal barriers and in-rack sprinklers are used to limit vertical flame propagation.

POSITION

Management Programs

Implement effective management programs for loss prevention and control in all areas discussed in *OVERVIEW*. Incorporate all practices and procedures necessary for the safe storage of garments into these programs. Place special emphasis on the following areas:

Housekeeping

Maintain aisles free of material. Keep the floor and catwalks clean.

Pre-Emergency Planning

Garments are susceptible to damage from smoke, soot and water. Establish salvage plans to limit such damage during and following a fire or other incident. Include removal of garments and use of deodorizing services.

Building Features

Provide heat and smoke venting on the basis of one unit of effective venting to 50 units of floor area. At least 50% of this requirement may be obtained by the use of symmetrically spaced exhaust fans (see PRC.2.1.4). Actuate the exhaust fans upon operation of any smoke or products-of-combustion detectors. Provide for fresh makeup air if the number of fans expected to operate will produce a negative pressure in the building that is sufficient to reduce fan output more than 10% below rated capacity. Obtain makeup air through protected wall openings or through ducts that lead from the outside to the area being exhausted. Equip openings or ducts with louvers that are arranged to open automatically when the fans operate. Provide control switches, at a remote cut-off location, that will permit selective manual operation of exhaust fans and fresh makeup air during emergencies. Describe the location and proper use of these switches in the pre-emergency planning procedures established in conjunction with the emergency response team or fire department.

Subdivide storage with noncombustible smoke barrier walls into areas that contain no more than $10,000,000 of storage. Protect all necessary wall openings with noncombustible smoke-tight doors arranged to close automatically upon operation of products-of-combustion detectors that are located at such openings.

Seal floor or roof penetrations above storage areas against liquid penetration.

Install all electrical equipment and wiring in accordance with the *National Electrical Code® (NEC*). Physically isolate load or control centers from storage areas. Locate lighting fixtures only over aisles. See PRC.5.11.1 and PRC.5.11.2 for precautions when using fluorescent or high intensity discharge (hid) lighting fixtures.

Protection

Maintain a clearance from top of storage to ceiling sprinklers of at least 3 ft (1 m) and not more than 10 ft (3 m). Submit plans that involve clearances greater than 10 ft (3 m) to the local AXA XL Risk Consulting Plan Review website for review. Maintain the bottom of the lowest tier of garment storage at least 6 in. (150 mm) off the floor.

Install smoke or products-of-combustion detectors throughout all storage areas unless hourly recorded watch tours are made during all idle periods.

Install hose connections, with no more than 100 ft (30 m) of 1½ in. (40 mm) woven jacketed, lined hose and adjustable spray nozzles, so that two hose streams can be applied to any point in the storage areas. Supply the hose connections from a separate supply or by check valve interconnection to two or more sprinkler systems. Include a combined hose demand of 500 gpm (1890 L/min) in the hydraulic calculations.

Install sprinklers per NFPA 13 and PRC.12.1.1.0.

Garments Stored Two Deep On Pipe Or Similar Fixed Racks, With At Least 40 in. (102 cm) Aisles Between Racks.

For storage 12 ft (3.7 m) or less and not more than 3 tiers high, provide automatic wet-pipe sprinkler protection at a density of 0.30 gpm/ft^2 (12.2 L/min/m^2) over the most hydraulically remote 4000 ft^2 (370 m^2) area of operation. Use 165°F (74°C) rated sprinklers.

For storage greater than 12 ft (3.7 m) or more than 3 tiers high, provide automatic wet pipe sprinkler protection at the ceiling designed for a density of 0.35 gpm/ft^2 (14.2 L/min/m^2) over the most hydraulically remote 4000 ft^2 (370 m^2) area of operation. Use 165°F (74°C) rated sprinklers. Sprinkler coverage should not exceed 100 ft^2 (9.3 m^2). Provide horizontal barriers in the racks at approximately 12 ft (3.7 m) vertical intervals. Extend the barriers the full length and width of the rack and at least 6 in. (150 mm) beyond the perimeter of the hanging garments. Provide a line of automatic sprinklers under each barrier along the center line of the rack (See Figure 1[a]), spaced not over 8 ft (2.4 m) apart. In-rack sprinklers should be 165°F (74°C) rated, quick response, with ½ in. (15 mm) orifice. Size the in-rack piping to supply five in-rack sprinklers under each of the barriers in one rack and a total of twice that number within the warehouse at an operating pressure of 30 psi (2 bar). Maintain a clearance of at least 6 in. (150 mm) between the in-rack sprinkler deflectors and the top of storage at the level where they are installed. If the catwalks are at the same elevation as the horizontal barriers and tightly abutted to them, the intermediate sprinklers may be installed along the centerline of the aisles rather than in the racks (see Figure 1[b]).

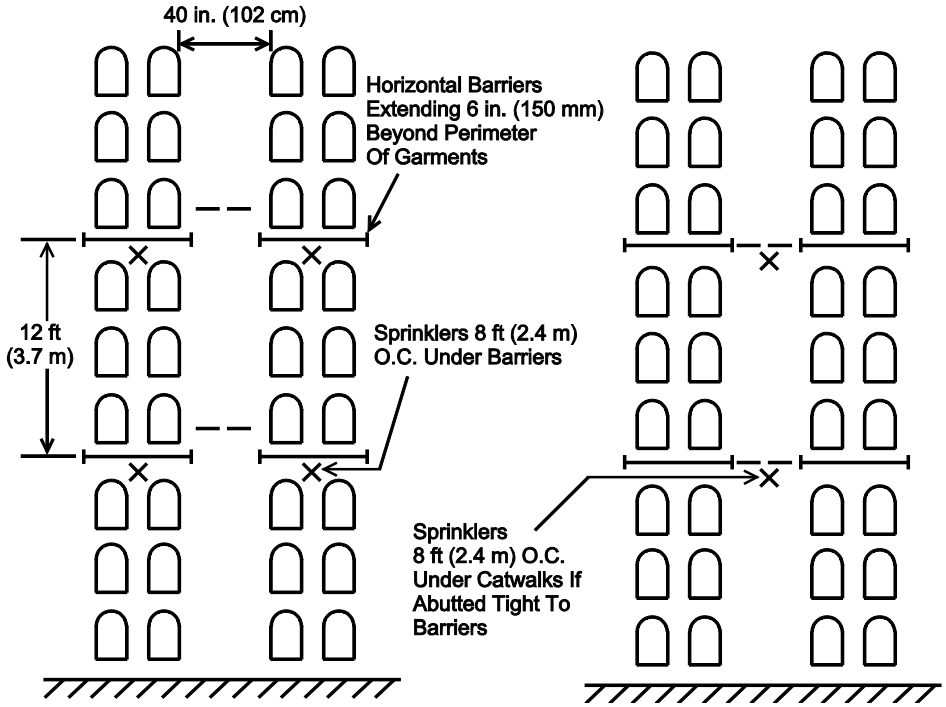

Figure 1. Fixed Pipe Racks.

Garments Hung On "Storosel" Or Similar Ferris-Wheel-Type Vertical Storage Conveyors, With 4 ft (1.2 m) Aisles Between Units (See Figure 2).

Provide automatic wet pipe sprinkler protection at a density of 0.35 gpm/ft^2 (14.2 L/min/m^2) over the hydraulically most remote 4000 ft^2 (370 m^2) area of operation, using 165°F (74°C) rated sprinklers. For racks ranging in height from 15 ft – 25 ft (4.6 m – 7.6 m), install one level of face and longitudinal in-rack sprinklers at approximately two-thirds of the rack height.

Space the in-rack sprinklers 8 ft – 10 ft (2.4 m – 3 m) on centers and staggered in relation to each other. Locate them so that when the conveyor is stopped at the point of normal retrieval, the sprinkler deflectors are located within the clear space between tiers. In-rack sprinklers should be 165°F (74°C) rated, quick response, with ½ in. (15 mm) orifice. Use sprinklers with 5 in. (130 mm) minimum diameter water shields. Size the in-rack sprinkler piping to supply 12 sprinklers in any one rack and a total of 24 within the warehouse at an operating pressure of 30 psi (2 bar).

DISCUSSION

In the small number of incidents that have occurred in hanging garments, ceiling sprinklers have proved effective fire control. Large-scale fire tests have shown a serious potential for an uncontrollable fire in higher rack arrays unless horizontal barriers and intermediate sprinkler protection are used.

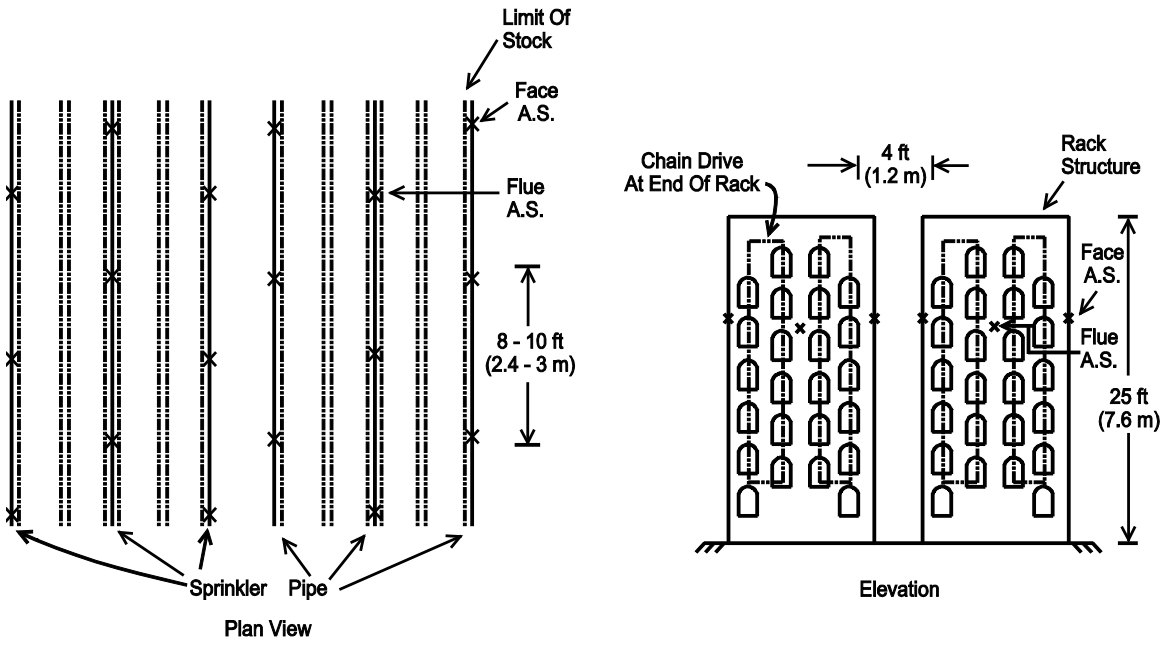

Figure 2. "Storosel" Vertical Storage Conveyor.

The major concern from a loss standpoint is the high susceptibility of garments to damage from smoke, soot and water contamination even when a fire has been quickly brought under control. Polyethylene covers, over the garments, do not alleviate the problem because of the openings at the neck of the garment and the apparent electrostatic attraction for soot that the material exhibits aggravates any salvage actions. Heat and smoke venting controls the travel of smoke and products of combustion and limits the amount of stock exposed in one area.

Using powered exhaust fans to remove the relatively cool smoke from beyond the immediate limits of the fire zone is of primary importance. Besides limiting the contamination to surrounding stock, venting provides sufficient visibility in the fire area to help avoid damage caused by misdirected hose streams.

Despite these measures, high contamination loss potential remains. Physical barriers (smoke partitions) can limit the exposure within a given area.

Loss Experience - Loss Figures

- Men's Sportswear - $1,329,475.

  Garments, e.g., jackets, sweatshirts, sweaters, etc., in polyethylene bags were hung to an overall height of 20 ft (6.1 m) and protected with 165°F (74°C) ceiling sprinklers designed for 0.33 gpm/ft^2 (13.4 L/min/m^2) over 3000 ft^2 (280 m^2). The fire apparently started in a small 5 ft (1.5 m) long rack in an aisle at the floor level and was controlled by one sprinkler. The majority of the damage was the result of smoke and soot contamination.

- Women's Dresses - $3,080,145.

  Women's dresses with polyethylene covers were hung in racks 10 ft (3 m) high. A fire started from unknown cause on the fourth floor in paper dress patterns. Seventeen sprinklers operated. Because heavy smoke obscured the fire area, the fire department used a deluge gun to break 950 panes of glass for venting purposes. Equipment, bolts of cloth, and finished garments sustained heavy water damage. Water flowed to lower floors through pipe and cable penetrations.

- Women's Dresses - $3,262,089.

Dresses made from synthetic fibers covered by polyethylene were hung on pipe racks 3 tiers high to a height of 11½ ft (3.5 m). Protection was by 2-3-5 wet pipe sprinkler system with 165°F (74°C) sprinklers. The cause of the fire was unknown. It started in a 3 tier rack of dresses and was controlled by four sprinklers. The majority of the damage was the result of smoke and soot contamination.

- Women's and Children's Clothing - $4,593,126.

Women's and children's clothing, primarily of synthetic fabrics, was hung in polyethylene bags, stored in 2 tiers to an approximate height of 8 ft (2.4 m). A fire of unknown origin was discovered among rolls of polyester cloth on the third floor and was held in check by six sprinklers. Water flowed through pipe and cable penetrations into the second and first floors. The majority of the damage to hanging stock was from water, smoke, and soot and it comprised approximately 20% of the loss.

- Men's Suits - $6,240,518.

Men's suits and sport coats, made of primarily synthetic fabrics, were hung in 3 tiers to a height of 11 ft (3.4 m). The majority of stock was not provided with polyethylene covers. Ordinary hazard wet pipe, 165°F (74°C) ceiling sprinklers were provided. The fire apparently was caused by sparking from an electrical junction box over the rack storage and was controlled by 17 sprinklers. The first 10 operating sprinklers were estimated to produce a density in excess of 0.30 gpm/ft^2 (12.2 L/min/m^2). Approximately 600 suits were involved in the fire. A total of 20,000 suits were damaged, the majority by soot and smoke.

These losses point out not only the need for protection, but also that the majority of the damage was from contamination.