RACK STORAGE OF ROLLED CARPETS

INTRODUCTION

Carpets are usually manufactured from natural fibers, such as wool or cotton, man-made fibers, such as nylon or acrylics, or blends of both. The pile or displayed surface of the carpet is attached to a jute, foamed plastic, foamed rubber, polyester or polypropylene backing. As finished products in a carpet mill warehouse or as supply items at a sales outlet, carpets are normally stored horizontally as rolls in a multi-tiered rack. Single racks are 12 ft – 15 ft (3.7 m – 4.6 m) deep, back-to-back racks are between 24 ft - 30 ft (7.3 m and 9.1 m) deep, with a storage height of up to 24 ft (7.3 m). Tiers are usually 3 ft (1 m) apart with shelves constructed of slatted lumber, solid plywood, or solid or perforated metal. A longitudinal flue exists between back-to-back racks but is often partially obstructed by roll ends. Transverse flues occur at rack-column lines 10 ft - 14 ft (3 m – 4.3 m) apart, but these are often obstructed by cross bracing. An alternative storage method for carpets is inside cardboard tubes. These tubes range from 12 in. – 36 in. (0.3 m – 1 m) in diameter and up to 15 ft (4.6 m) deep. The tube walls are usually ⅝ in. (16 mm) thick. The tubes are stacked on top of each other between two walls or two supports.

In the finished products warehouse, carpets are wrapped in a plastic or synthetic-fiber reinforced, impregnated paper which affords reasonably good abrasion resistance during handling, along with short term protection against water and external contamination. In supply warehouses, carpets may or may not be wrapped.

The tight arrangement in which carpets are stored in a fully loaded rack precludes any effective water penetration from tier to tier even when slatted or perforated shelving is used. Accordingly, the average carpet rack is comparable to a multi-row rack with multi-level solid shelves of unusual depth and width.

In-rack sprinklers under every shelf are the only way to achieve prompt and effective control of a fire in a standard carpet rack storage arrangement. However, this is a highly expensive proposition. For instance, in an 8 tier, 24 ft (7.3 m) high rack, 7 levels of in-rack sprinklers would be necessary. If less in-rack sprinkler protection is relied upon, fire spread must be expected for the full length and width of the rack in the unprotected tiers. Interruption of flame propagation in the unprotected tiers from overhead sprinkler discharge cannot be relied upon. The only reliable method for restricting such flame propagation is to use vertical barriers or bulkheads in the racks.

The protection of carpet racks is a compromise between what is actually needed and what is economically practical. This compromise consists of subdividing the racks by vertical barriers, and providing sufficient ceiling and in-rack sprinkler protection. This ensures protection of the building proper and continued containment of the fire within its designated confines, until it can be finally extinguished by hose streams.

An unusual degree of reliance is placed upon manual firefighting efforts. Give careful attention to environmental conditions, the need for successful maneuvering during fire overhaul and strategically located hose connections.

Recognize that the unusual protection difficulties will probably result in higher than normal damage from fire, water and smoke.

POSITION

General

- Install all sprinkler protection in accordance with NFPA 13 and PRC.12.1.1.0, as modified by this guideline.
- Provide adequate floor drains or wall scuppers. In multi-storied facilities, waterproof the floors effectively.
- Maintain a high standard of housekeeping. Provide trash containers with self-closing covers.
- Rigidly enforce “No smoking” regulations.
- Prohibit open flame devices, such as welding equipment or open infrared heaters, in the storage areas. (See PRC.4.3.1 for additional information.)
- Locate lighting fixtures and unit heaters over the aisles. Provide fluorescent lighting fixtures with individual thermal protection on all ballasts.
- Avoid electric irons for the application of labels.

Building Protection

- Provide automatic heat and smoke venting on the basis of 300 cfm (8.5 m^3/min) for every 100 ft^2 (9.3 m^2) of floor area powered ventilators. Install in accordance with PRC.2.1.4.
- Provide noncombustible draft curtains of a maximum feasible depth to enclose spaces over every 25,000 ft^2 (2322 m^2) of floor area.
- Provide 1 in. (25.4 mm) hose connections with 1½ in. (38.1 mm) woven-jacketed, lined fire hose and adjustable spray nozzle at sufficient intervals throughout the warehouse to ensure application of at least two hose streams to any point in the racks. Maximum hose length is 75 ft (22.8 m). Feed hose connections so that these will not be impaired simultaneously with either ceiling or in-rack sprinkler protection in the area in which the connections are located. Hose reels with 1 in. (25.4 mm) rubber hose can be operated by one person and can be used as an alternative to the above woven jacket type of hose.

Rack Storage Protection

Both barriers and in-rack sprinklers are necessary for successful control.

- Install vertical and horizontal barriers constructed of ½ in. (12.5 mm) listed fire retardant plywood as indicated in Figure 1. Install vertical barriers for the full width of the rack at a maximum spacing of 30 ft – 36 ft (9.1 m – 11 m), dependent upon rack-column intervals. Sheet metal, 22 gauge (0.78 mm), can be used in lieu of the fire retardant plywood for the vertical barriers. Extend the barriers above the top of storage and protrude 1 ft (0.3 m) on the aisle face to preclude fire communication from one zone to another. Install horizontal barriers at maximum 40 in. (1 m) intervals for the height of the rack.
- Install a wet-pipe system for the ceiling sprinkler system, hydraulically designed to provide a 0.30 gpm/ft^2 (12.2 L/min/m^2) density over the most remote 4000 ft^2 (372 m^2) area of operation using 286°F (141°C) sprinklers. When vertical barriers are installed at 20 ft (6.1 m) intervals or less, or the overall rack depth is 15 ft (4.6 m) or less, the area of operation may be reduced to 3000 ft^2 (279 m^2).

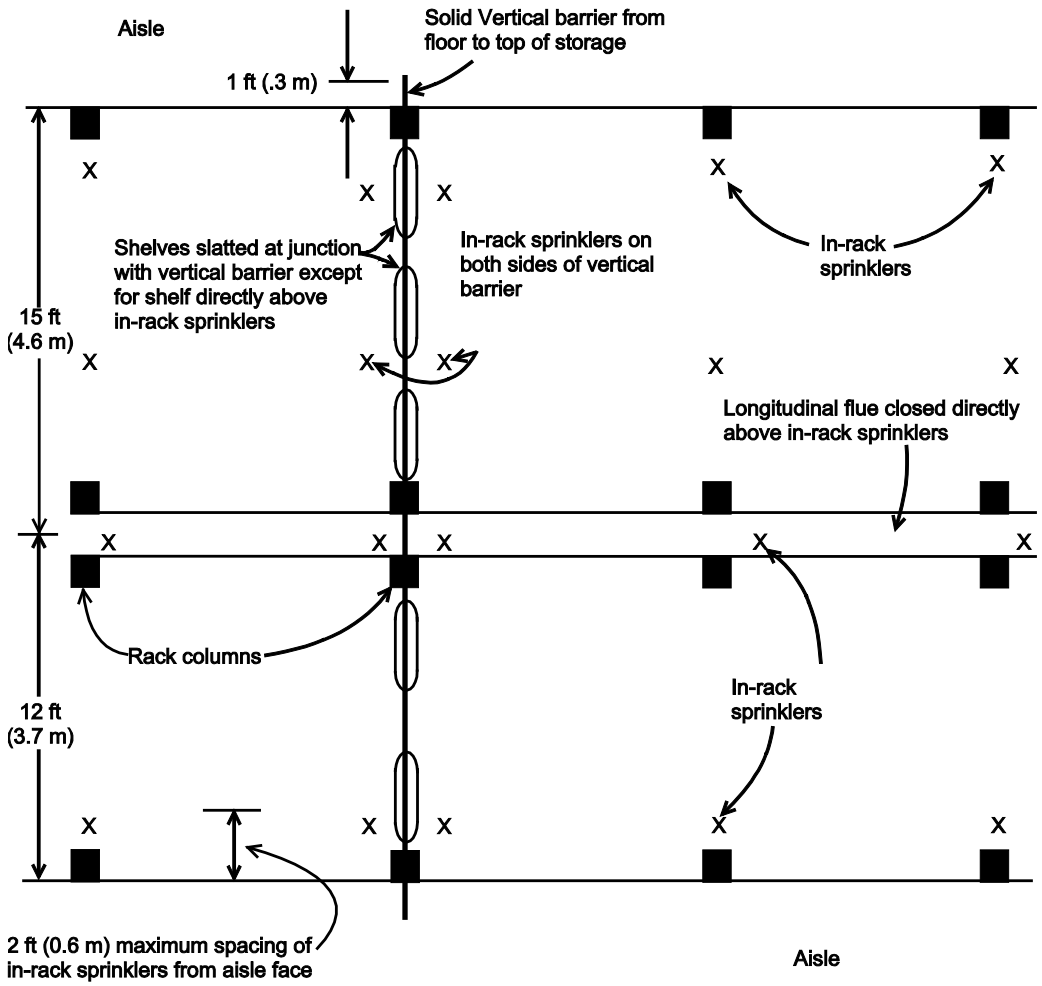

Figure 1. Plan View Showing Typical In-Rack Sprinkler, Barrier And Shelf Arrangement For 12 ft And 15 ft (3.7 m And 4.6 m) Back-To-Back Carpet Racks.

- Install one level of 165°F (74°C) quick response in-rack sprinklers at the approximate mid-height in all racks with storage height over 12 ft (3.7 m) up to and including 24 ft (7.3 m). Additional guidance for in-rack sprinklers is as follows: (See Figure 2.)
- Install in-rack sprinklers no farther than 10 ft (3 m) apart along rack-column lines and no farther than 2 ft (0.6 m) from the aisle face.
- Protect piping from potential mechanical damage caused by rugs being moved into or out of the rack.
- Install in-rack sprinklers on both sides of vertical barriers at the column line where such barriers are provided. (See Figure 3.)
- Feed in-rack sprinklers from a separate riser so that the sprinklers may be shut off for repairs or modifications without interrupting sprinkler protection at the ceiling or provide shut-off valves at each drop from the ceiling system for the in-rack sprinklers.
- Locate in-rack sprinklers to provide 6 in. (152 mm) minimum clearance between deflector and top of rolls.
- Hydraulically design in-rack sprinkler piping to supply all the sprinklers between any two barriers, on the basis that these will operate simultaneously at 30 psi (2 bar) nozzle pressure.

- Notch or slot all horizontal barriers, except the one directly above the in-rack sprinklers, at each juncture with a vertical barrier. (Maximum length of a slot will be governed by how the shelf is supported.) (See Figure 1.)
- Locate the bottom shelves of racks at least 4 in. (100 mm) above the floor and arrange to prevent accumulation of debris underneath.
- For a rack height of 12 ft (3.7 m) or less, ceiling protection alone may be acceptable, but vertical barriers are still required as in item 1.
- Design racks to allow for the increased loading caused by carpets becoming soaked from sprinkler or hose stream water.

Tube Storage Protection

- Install a wet pipe system for the ceiling sprinkler system, hydraulically designed to provide a 0.30 gpm/ft^2 (12.2 L/min/m^2) density over the most remote 3000 ft^2 (279 m^2) area of operation using 286°F (141°C) sprinklers for storage up to 25 ft (7.6 m).
- The length of the tube should be the same length of the carpet or greater.
- Locate the bottom level of tubes at least 4 in. (100 mm) above the floor and arrange to prevent accumulation of debris underneath, and to minimize water damage.

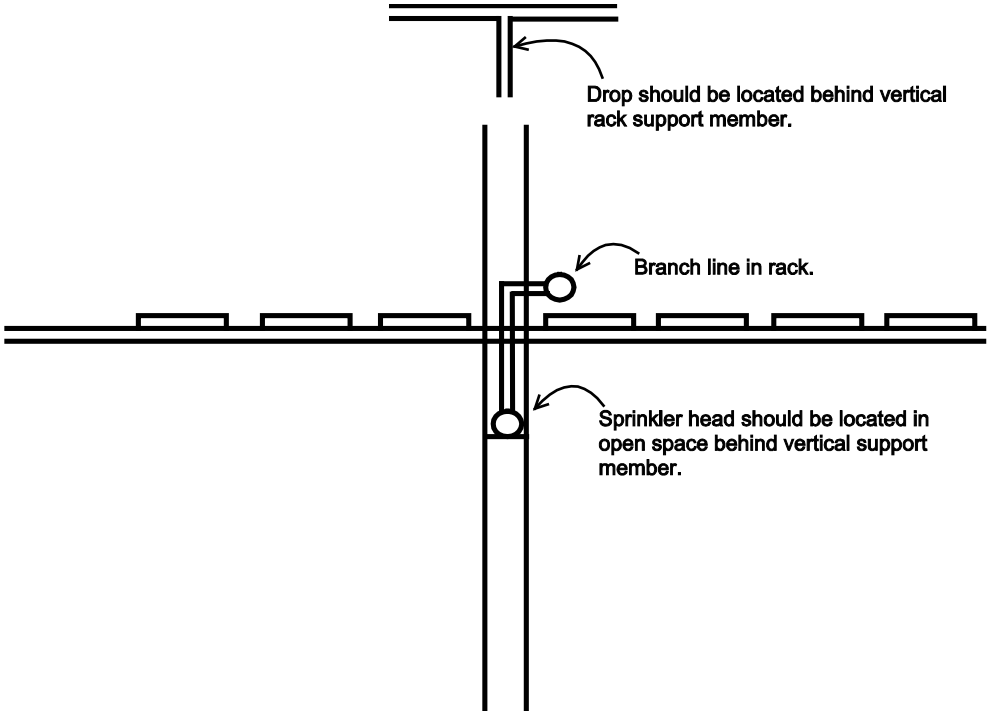

Figure 2. Rack Sprinkler Installation With No Fire Stops or Bulkheads.

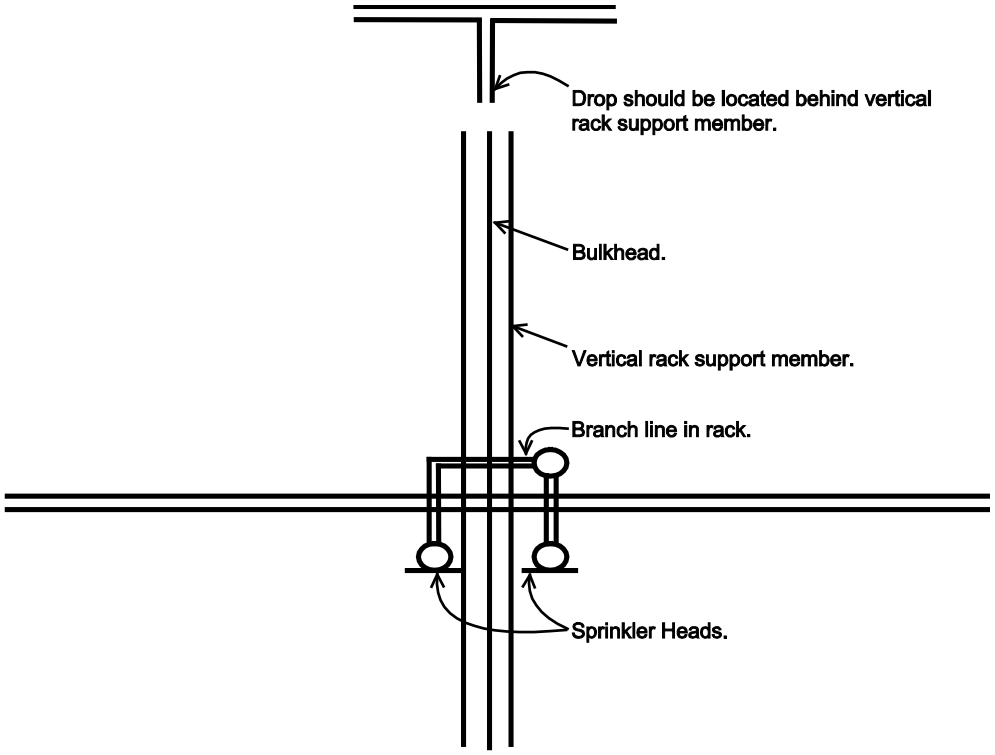

Figure 3. Rack Sprinkler Installation With Fire Stops or Bulkheads.