Code Requirements and Rack Design for In-Rack Sprinklers

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MODEx 2014
Warehouse fire & statistics

Figure 1A. Reported Structure Fires in U.S. Warehouses, by Year: 1980-2011

Source: NFPA
Warehouse fire & statistics

Figure 1B. Inflation-Adjusted Direct Property Damage in U.S. Warehouses, by Year: 1980-2011

Source: NFPA
Warehouse fire & statistics

Figure 2. Structure Fires in Warehouses by Leading Cause, 2007 -2011 Annual Averages

- Intentional: 19%
- Electrical distribution or lighting equipment: 13%
- Heating equipment: 9%
- Shop tools and industrial equipment: 8%
- Torch, burner or soldering iron: 8%
- Exposure fire: 7%
- Smoking materials: 4%
- Cooking equipment: 4%

Source: NFPA
Recent significant warehouse fires

Record storage – NJ
Recent significant warehouse fires

Plastics ASRS - SC
Recent significant warehouse fires

Refrigerated processed meat – NJ
Recent significant warehouse fires

Retail store with storage in rear – SC
Solutions: Sprinklers - effective

<table>
<thead>
<tr>
<th>Sprinkler Systems in Warehouse Structure Fires</th>
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<tbody>
<tr>
<td>Percent of structure fires in warehouses reporting some type of sprinkler present</td>
<td>32%</td>
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<tr>
<td>Percent of fires with wet pipe sprinklers in which sprinklers operated</td>
<td>86%</td>
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<tr>
<td>Percent of fires with wet pipe sprinklers present in which sprinklers operated effectively</td>
<td>84%</td>
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<tr>
<td>Reduction in civilian deaths per thousand fires when wet pipe sprinklers were present</td>
<td>61%</td>
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* Excludes properties under construction and fires where sprinklers were not present in the fire area.

Source: NFIRS 3.0 and NFPA survey.
Pertinent design & building codes

- National Fire Protection Assn. (NFPA) 13
- International Fire Code
- Edition varies by jurisdiction
- Authority Having Jurisdiction (AHJ) role
3 Basic Questions:

• What is stored?
• How is it stored?
• How high is it stored?
What is stored?

- Class I: “…non-combustible on pallets, ..single-layered carton..”
What is stored?

- Class II: “...non-combustible in wooden crates, ..multiple-layered carton..”
What is stored?

- Class III: “…product fashioned from wood, paper, natural fibers ..or Group C plastics..”
What is stored?

• Class IV: “Group B plastics or partial (5-25%) Group A plastics.”
  – Cellulosics
  – Chloroprene rubber
  – Fluroplastics
  – Natural rubber
  – Nylon
  – Silicone rubber
What is stored?

- Group A Plastics
What is stored?

- Mixed commodities
What is stored?

- Pallet types
How is it stored?

• Floor stacked
How is it stored?

- Solid shelving
How is it stored?

- Back to back racks
How is it stored?

• High density (pallet flow, push back, drive-in, ASRS)
How high is it stored?

- < 12 feet
- <= 25 feet
- > 25 feet
Special cases

- Tires
Special cases

- Rolled paper
Special cases

• Record storage
Special cases

• Movable shelving
Special cases

• High volume, low velocity fans
Impact of sprinklers on rack design

- Flue spaces
  - Transverse
  - Longitudinal
  - IFC 2012 code change – AHJ can demand “devices”
Impact of sprinklers on rack design

• “Open” shelves
Impact of sprinklers on rack design

• Solid Shelving
Impact of sprinklers on rack design

- Clearances for water spray
Impact of sprinklers on rack design

• Location to prevent head damage from lift equipment
Impact of sprinklers on rack design

- Weight of pipes with water
- Solid baffles (horizontal & vertical for aerosols, plastics)
Impact of sprinklers on rack design

- Seismic bracing
ESFR type sprinklers

- Definition
- Advantages
- Disadvantages
- Comparison to conventional
Trends in protection schemes

- Suppression vs. containment
- Firefighter action (or inaction)
- Recent NFPA Research Foundation for suppression ideas re: ASRS structures
Trends in protection schemes

- Any expected changes to codes in the works
Q & A

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