Warehouse Fire Sprinkler Codes and Impact on Storage Racks

Presented by:
DACS, Inc.
Gary T. Smith, PE
DACS, Inc.
Senior VP Sales & Marketing
Today’s Topics

• Warehouse fire statistics
• Recent significant warehouse fires
• Sprinkler system design basics
• Impact on racking layout
• Current code enforcement trends
Warehouse fire statistics

Figure 1. Reported Structure Fires in U.S. Warehouses, 1980-2013
Warehouse fire statistics

Figure 2. Inflation-Adjusted Direct Property Damage, 1980-2013 in Warehouse Structure Fires
Warehouse fire statistics

Figure 3. Structure Fires in Warehouses by Leading Cause, 2009-2013 Annual Averages (top 5 listed)

- Intentional: 18% (Fires), 21% (Civilian Injuries), 32% (Direct Property Damage)
- Electrical distribution and lighting equipment: 18% (Fires), 17% (Direct Property Damage)
- Heating equipment: 8% (Fires), 0% (Civilian Injuries), 3% (Direct Property Damage)
- Exposure fire: 7% (Fires), 0% (Civilian Injuries), 7% (Direct Property Damage)
- Smoking materials: 5% (Fires), 0% (Civilian Injuries), 11% (Direct Property Damage)
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
Recent significant warehouse fires

Gap clothing - NY
Recent significant warehouse fires

Furniture storage - IL
Solutions: Sprinklers – effective

<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage</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>
</tr>
<tr>
<td>Percent of fires with wet pipe sprinklers present in which sprinklers operated effectively</td>
<td>84%</td>
</tr>
<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 5.0 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
• FM Global Data Sheets
Design process: 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
  - Chlorophrene rubber
  - Fluroplastics
  - Natural rubber
  - Nylon
  - Silicone rubber
What is stored?

- Group A Plastics
What is stored?

• Mixed commodities
How is it stored?

• Solid Shelving
How is it stored? Pallets matter

- Commodity classes assume wooden pallets
- Plastic pallets with FM or UL approval considered wood
- Unreinforced plastic pallets get automatic 1 class increase
- Reinforced plastic pallets get 2 class increase
- Unlabeled automatically assumes Reinforced (+ 2 classes)
How *high* is it stored?

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

• Tires
Special cases

• Paper file storage
Special cases

• Movable office 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

- Flue 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

- Solid baffles (horizontal & vertical)
  - Aerosols
  - Auto fluids
  - Plastics
  - Furniture
  - Liquors
Current code enforcement trends
Issues being heard

• Why all the recent concern about warehouse fire protection?
• I need longer row spacers
• I need longer beams
• I need a device to keep product out of “flue” spaces
• I need something called a “baffle” or “barrier”
• Do all these requirements really make a difference?
• Why is my rack permit being held up by the fire marshal?
• I need a “High Pile Permit”? 
Reason # 1: Changes in commodities being stored

A Baby Boomer Christmas
Reason # 1: Changes in commodities being stored

A Millennial Christmas
Reason # 1: Changes in commodities being stored

I just want to say one word to you. Just one word. Plastics.
Reason # 2: *Fire fighting philosophy*
Reason # 3: Larger financial loses
Reason # 4: Changes in protection schemes / equipment

Rack geometry, in conjunction with the customer’s product size & placement, is an integral part of the overall fire suppression scheme.
For More Information

Speaker email: gsmith@dacsinc.com
website: www.dacsinc.com
Or visit PROMAT Booth # S 1959