Aerosols

Understanding the Risk

Aerosol products, defined as a suspension of solid or liquid particles in a gas and contained in a non-reusable dispenser, pose a major fire hazard in a variety of occupancy types. Aerosol products can be highly flammable and will be detailed in the suppliers Material Safety Data Sheets. Flammable and combustible product, combined with propellant creates an explosion hazard should the aerosol container be punctured and exposed to intense heat or an ignition source. Containers can also rupture when incinerated, exposed to the heat of the sun, exposed to a heat source or the heat of a fire. A ruptured container can be projected across a large area as a fireball and create a path of flammable liquid in its path. The resultant multiple seat fires means a fire can grow and spread rapidly to adjacent areas, overtaxing the sprinkler system and rendering most fire-fighting efforts inadequate.

Aerosol products are classified according to the “heats of combustion” of the products. The classifications are based on extensive fire testing and consist of three levels, as follows:

- **Level 1** – (Low) Mostly water-based. Examples of Level 1 products are shaving cream, oven cleaner, spray starch, carpet shampoo and window cleaner.
- **Level 2** – (Medium) Water miscible flammable and combustible liquids. Examples of Level 2 products are furniture polish spray, hairspray, antiseptic spray, deodorant and windshield deicer.
- **Level 3** – (High) Mostly insoluble flammable and combustible liquids. Examples of Level 3 products are lacquers, spray paints, auto engine cleaners and lubricants, insecticides and some antiperspirants.

Related Losses

There have been a number of serious fires globally where aerosols have been involved. For example a large distribution warehouse fire that occurred in June 1982 in Pennsylvania, USA. The storage consisted of water, petroleum and alcohol based aerosol product. The fire started when a carton of aerosol stock was punctured after falling from a rack. The combustible product exploded into a fire that grew so fast that efforts to extinguish it manually had to be abandoned. The fire reached the roof of the storage warehouse in around 13 minutes and burned for approximately 8-hours. Aerosol containers were noted to be rocketing across adjacent areas in the warehouse causing multi-seat fires, resulting in the automatic sprinkler system being overwhelmed. Fire fighters reported aerosol containers rocketing through the collapsed roof. The loss was reported to be $100 million in 1982 US dollars. NFPA 30B, Code for the Manufacture and Storage of Aerosol Products, was written to provide a standard protocol to establish the proper storage of aerosols.

Controlling the Hazard

Controlling storage of aerosol products, limiting the quantities stored and segregating product are part of the overall risk management strategy in mitigating a fire loss. There are several recommendations for storage:

- Store products in a separate fire resistive constructed building, away from other buildings. The storage building should be provided with fire rated openings, explosion relief venting and heat and smoke venting. Segregate aerosol products and provide containment to prevent rocketing ruptured containers from spreading fire in adjacent areas of the facility. General rules for storage location by classification include:
Aerosols

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Location</td>
<td>Separate Building</td>
<td>Separate Building</td>
</tr>
<tr>
<td>Cutoff Room</td>
<td></td>
<td>Separate Area</td>
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Refer to NFPA 30B

- Store products in a 3-hour rated fire resistive room within the facility
- Provide an expanded metal or wire mesh caged area within the facility that is located away from other storage and against an outside wall. The mesh size must be small enough (recommended not to exceed 25mm by 25mm) to prevent cans rocketing beyond the caged area. The entrance to the chain link enclosure should be self-closing.

Racking Mesh in proposed aerosol storage area

- In order to effectively control the fire hazard associated with aerosol product storage, it is necessary to have in place an effective combination of both human element and physical protection controls. Human Element controls relate to the management procedures aimed at reducing the likelihood of a fire occurring and ensuring an effective response in the event of a fire. Physical Protection controls relate to protection or design principles aimed at reducing or mitigating the effect in the event of a fire. Issues detailed under these two headings should be considered fully, to create an integrated risk control program.

Human Element

- Special attention should be given to housekeeping in and around the storage area. Aisles should be kept clear of all storage.
- Inventory and document aerosol products according to their flammability level.
- Material Safety Data Sheets (MSDS) should be maintained on all products stored.
- Current MSDS information should be on file with the local fire department, or the agency that will be the first responder for the facility in a fire emergency
- “No Smoking” regulations should be strictly enforced
- A “Hot Work” permit system should be implemented that specifies no open flame be used near the aerosol storage area

Physical

- Provide specially designed sprinkler systems for protection that matches the product
- Storage arrangements and pallet load amounts should follow NFPA standards
- Areas where aerosols are stored should be well ventilated
- As flammable vapors from aerosols are denser than air, storage should not be within or near to basements or low lying areas to prevent accumulation of flammable gases
- Aerosols should be stored away from heat sources
- Damaged or leaking aerosols should be removed to open air by the shortest route available so vapours can be dispersed safely. Only specially adapted forklift trucks designed for use in flammable atmospheres should be used to move damaged stock.

Aerosol product storage should be analyzed and controlled according to occupancy type. In occupancies where storage of such products is incidental to the main operation, measures should be taken to keep the quantity stored to a low level and segregate the storage away from combustible materials. Where large quantities of Level 2 and Level 3 aerosol products must be stored, such as warehouses, an engineering analysis should be performed in accordance to NFPA or local Standards providing equivalent protection. AIG Risk Engineering can provide advice for controlling the hazard and assistance in developing sprinkler system design criteria to provide adequate protection for your facility.

Standards

The references are:
NFPA 30B, Code for the Manufacture and Storage of Aerosol Products
FPA RC19 – Recommendations for the storage of aerosol products

For further information, contact your local GLP AIG Risk Engineer
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