LIVERMORE
CALIFORNIA

Storage Racks, Display Cases, and Shelving

Permit Requirements:

Height of Highest Shelf:	Requirement:
Up to 5'9" above the floor	No permit required
5'9" to 8' above the floor	Anchors and bracing. Building permit required. No engineering requirements.
Higher than 8' above the floor	Building permit required. Engineering Required.

The following information must be submitted along with your permit application:

- A location plan showing which building and suite is involved.
- Three copies of floor plan showing where the storage units will be located within the building and the layout of the units.
- Two sets of Engineering calculations for vertical & lateral loads *(if top shelf is higher than 8')*, with wet seal and signature of engineer on the plans and calculations.
- Construction details for the racks or shelves, including dimensions *(cross-section of entire system).*
- Lateral bracing details.
- Anchorage details including type, size, depth, and spacing of anchors. The anchorage details must be clearly shown on the plans.
- Combustible Material Storage Plan Package. (*if required*)
- *Tenant Information and Emergency Information forms signed by the owner of the business (*if required).*
- *Special inspection information *(if required).*

*Tenant and Emergency Information forms are not applicable if there is no tenant, however, before the building space(s) can be released for occupancy, this information must be submitted and approved.

*Dependant upon your design and engineering calculations, special inspection may be required for anchoring racks to floor and for welding of rack components. Special inspections are inspections performed by an approved, independent inspection agency in addition to City inspections.

Note: Fire sprinklers are required for some rack and shelving installations. That decision is based upon several factors, including the type of sprinkler system *(if any)* that exists in the building, the type of storage system proposed *(single/double/multiple units),* open versus solid shelving, height of racks or shelves, height of storage, and type and quantity of material/commodity stored. Plastic commodity storage exceeding 6' may require fire sprinkler protection in the storage rack shelving.

Fire sprinkler protection is based on storage height, not the shelf or rack structure height, and the type of commodity placed in the storage system. For additional requirements please contact Fire Prevention at (925)-454-2362.

City Hall
Permit Center

Community Development Department
1052 South Livermore Avenue
Livermore, CA 94550

phone: (925) 960-4410
fax: (925) 960-4419
TDD: (925) 960-4104

www.cityoflivermore.net

Combustible Material Storage Plan Package

Overview

The California Fire Code specifies requirements for the storage of combustible materials. General requirements for solid materials are found in Chapter 3, Section 315.

In buildings with fire sprinklers: storage of solid combustible materials is subject to limitations specified in NFPA Standard 13 – Standard for the Installation of Fire Sprinklers. Requirements for flammable and combustible liquids, aerosols, other hazardous materials and special items are found in various other NFPA standards. These provisions help ensure that a fire involving combustible material storage does not overwhelm the fire sprinkler system and severely damage or destroy the building, its contents, or harm or kill people. At a minimum, storage of combustible materials requires a fire sprinkler design of Ordinary Hazard (Group 1).

In buildings without fire sprinklers: various code requirements place limitations on the total amount, storage height, etc. on storage of combustible commodities. For example, the Fire Code requires fire sprinklers to be provided for combustible material storage 12 feet and greater that exceeds specified amounts. NFPA 13 specifies how these systems are to be designed and installed.

High-piled Storage Additional requirements for storage that meets the definition of high-piled are found in Chapter 32. High-piled combustible storage is defined as:

> *Storage of combustible materials in closely packed piles or combustible materials on pallets, in racks or on shelves where the top of storage is greater than 12 feet in height. When required by the Fire Code official, high-piled combustible storage also includes certain high-hazard commodities, such as rubber tires, Group A plastics, flammable liquids, idle pallets and similar commodities, where the top of storage is greater than 6 feet in height.*
>
> Note: combustible materials include non-combustible products (such as metal parts) when contained in combustible packaging or containers and/or on combustible pallets.

Additional requirements for the storage of flammable and combustible liquids, flammable solids and other hazardous materials are found in various Chapters of the Fire Code beginning with Chapter 27.

Fire Department Review

In order to evaluate compliance with code requirements, the Fire Department needs information about the types of commodities stored, the storage configuration, the building and the fire protection system. Businesses are required to provide the necessary information in a concise, organized, and legible manner. In the case of high-piled combustible materials storage, this information must be kept at the facility and made available to the Fire Department upon request.

While a specific format for this information is not required, the Fire Department has developed this combustible material storage plan package to assist businesses comply with this requirement. In some cases, additional informational information may be needed to fully evaluate a facility's compliance with code requirements. If the applicant is aware of such information, please include it in the submittal. The Fire Department will request additional information as needed. This package consists of:

- General Information Form
- Map Instructions
- Storage Array Detail Form and Instructions
- Commodity Detail Form and Instructions
- Commodity Classification Information

Combustible Material Storage Plan

General Information Form

Facility Information	
Facility Name	
Facility Address	
Date	

Overview of the Facility, the Products stored and the Method(s) of Storage	
Facility Business Activity	
Type(s) of Products Stored (General Description)	
Method(s) of storage (check all that apply)	□ Shelves (less than 30 inches deep) □ Racks □ Piles on the floor □ Bin boxes □ Other; Describe:
Type of pallets	□ No pallets used □ Wood; Weight of empty pallet: _____ □ Plastic; Weight of empty pallet: _____ □ UL 2335 listed; Weight of empty pallet: _____ (attach cut sheet for listed pallets) □ Other: _____ Weight of empty pallet: _____
Idle pallet storage	□ Stored inside □ Stored outside Check all that apply

Automatic Fire Protection Systems	
Does the building have fire sprinklers	□ Yes □ No
Fire sprinkler system design (available on the fire riser plaque) *Additional information such as temperature of the heads will be requested if needed.*	Density: _____ gallons per minute Design Area of Discharge: _____ square feet Head spacing: _____
Do racks contain fire sprinklers	□ Yes □ Some do, some do not □ No
Maximum Ceiling Height	
Describe any other automatic fire suppression or detection systems	

Attachments - Required		
Site Map(s)	□ Attached	Number of pages:
Storage Detail Form (s)	□ Attached	Number of pages:
Commodity Form(s)	□ Attached	Number of pages:

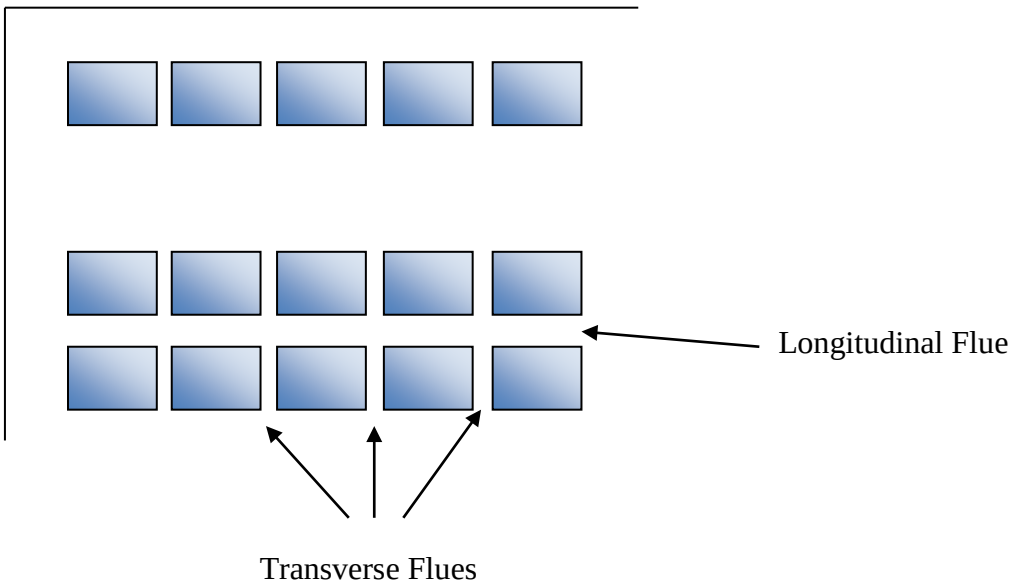
Submitted by Name (print)		Signature	
Title		Phone	
Date		Email	

Combustible Material Storage Plan

Site Map Instructions

In addition to any construction plans/blueprints, provide a map or maps on 8 ½ x 11 inch paper that contain the information listed below. At least on complete site map is required. Additional sheets should be used when one page would be too small or too crowded to show the required details for the entire facility.

- □ **Property lines and adjoining streets:** Self explanatory
- □ **Location of building on the property and fire department access doors:** show the outline of the building's exterior walls, including exterior doors, and internal roads, drives and parking areas.
- □ **Location and dimensions (i.e. footprint) of the high piled storage arrays:** show interior walls and doors within the building and the footprint of each storage rack or pile. You do not need to show every wall in areas like office suites that are not associated with the storage.
- □ **Identify the type of storage:** piles on the floor, racks, shelves or bin boxes – Self explanatory
- □ **Aisle dimensions between each pile or rack – width and clear height:** Self explanatory
- □ **Type and location of smoke removal systems:** For example, smoke vents in the ceiling. Explain how they operate.
- □ **Type, location and specifications of curtain board (draft curtain) systems.**
- □ **For racks, dimensions and locations of transverse and longitudinal flue spaces:** Transverse flue spaces are the spaced between rows of storage and are parallel to the direction of loading. Longitudinal flue spaces are the spaces between storage racks and are perpendicular to the direction of loading.
- □ **Identification symbol for each storage array:** This identifier will match the Storage Detail Form to the storage arrays on the map. Individual racks or piles can be grouped under the same identifier if all the information required on the Storage Detail Form is the same.
- □ **For racks with in-rack sprinkler provide an elevation view of the racks showing the in rack sprinklers**
- □ **Location of valves controlling the water supply of ceiling and in-rack sprinklers.**



Combustible Material Storage Plan

Storage Array Detail Form

Fill out one form per type of storage array. **See Instructions for definitions and further detail.**

Facility Name	
Facility Address	
Date	
Array Identifier (as shown on map)	
Type of array – Specify one	□ Rack - Type: □ Single Row; □ Double Row; □ Multiple Row □ Shelf □ Back-to-Back Shelf □ On the floor- Type: □ Solid Pile □ Palletized on floor
Minimum clear height in aisles	□ N/A – clear to roof/ceiling □ Structural supports, catwalks and/or other obstructions are present : _____ feet and ____inches
Type of rack shelves (see back for definition)	□ Solid □ Not solid □ N/A, not rack storage
Number of tiers of storage	□ _____ □ N/A – not rack/shelf storage
Maximum usable storage height (to top of commodity, not height of top shelf)	
Type of stocking and picking	□ Manual □ Mechanical □ Automated
Clearance from the top of storage to fire sprinkler head deflectors	
For Shelf, Pallatized and Solid Pile:	Maximum array volume of storage array: _____
Commodity stored (Should match name(s) on Commodity form(s))	

Combustible Material Storage Plan

Storage Array Detail Form Instructions

In addition to any construction plans/blueprints, provide a map or maps on 8 ½ x 11 inch paper that contain the information listed below. At least on complete site map is required. Additional sheets should be used when one page would be too small or too crowded to show the required details for the entire facility.

- □ **Storage array identifier (as shown on map(s)):** This identifier matches the storage footprints on the map(s) to the Storage Detail Form
- □ **Type of array:** Shelf storage is storage on shelves less than 30 inches deep with the distance between shelves not exceeding 3 feet vertically. All other shelving arrangements are considered rack storage. Pile storage is storage on the floor; this does not include storage in shelves or rack where the first tier of storage is on the floor.
- □ **Minimum clear height in aisles:** Required aisle width shall extend from floor to ceiling. Rack structural supports and catwalks are allowed to cross aisles at a minimum height of 6 feet 8 inches above the finished floor level, provided that such supports do not interfere with fire department hose stream trajectory.
- □ **Type of racks:** Shelving that is solid, slated or of other construction located in racks is considered to be **solid. Solid** does not include rack shelves that are mesh, grated, slatted or of similar design having uniform opening not more than 6 inches apart, with the openings comprising at least 50 percent of the overall shelf area, and with approved flue spaces in the racks.
- □ **Number of tiers of storage:** For racks, the number of storage layers – this includes the floor and shelves, if the floor can be used for storage.
- □ **Maximum usable storage height:** The maximum height to which materials can be stored, measured at the top of the materials stored, not the highest shelf.
- □ **Type of stocking and picking:** Mechanical stocking methods utilize motorized vehicles or hydraulic jacks to move stock. Manual stocking methods utilize ladders or other non-mechanical equipment to move stock. Automated storage involves moving rack or shelf components, such as carousels or conveyor systems.
- □ **Clearance from the top of storage to fire sprinkler head deflectors:** The deflector is the flat piece of metal that disperses the water released by the sprinkler head.
- □ **For pile on the floor, the maximum pile volume and the number of piles:** For each contiguous pile, provide the volume of the pile.
- □ **Commodity stored:** The name(s) on the Commodity Detail should be used.

Combustible Material Storage Plan

Commodity Detail Form

Fill out one form for each type of commodity. "Commodity" includes the product, packing materials and container. Different products can be included on the same Commodity Detail Form if all are packaged the same way and use the same type of pallets (if pallets are used). Note that the highest hazard product present will be used to classify the commodity.

See Instructions for definitions and further detail.

Facility Name	
Facility Address	
Date	

Commodity Name	
Description of the product(s)	
Description of packaging material(s)	
Description of containers(s)	
Are groups of packages banded	□ Yes □ No
Are groups of packages encapsulated	□ Yes □ No
Type of pallets	□ No pallets used □ Wood □ Plastic □ UL 2335 listed (attach cut sheet for listed pallets) □ Other: _____
Non Expanded Plastics (check all that apply) (do not include pallet in calculation)	□ Group A Percentage by weight: _____ □ Group B Percentage by weight: _____ □ Group C Percentage by weight: _____
Expanded Group A Plastics	Percentage by weight _____ **or** Percentage by volume _____
Commodity Classification (select one)	□ I □ II □ III □ IV □ High Hazard (as defined by the Fire Code)
Managed as Group A Plastic per NFPA 13	□ Yes □ No

Combustible Material Storage Plan

Storage Detail Form Instructions

In addition to any construction plans/blueprints, provide a map or maps on 8 ½ x 11 inch paper that contain the information listed below. At least on complete site map is required. Additional sheets should be used when one page would be too small or too crowded to show the required details for the entire facility.

- □ **Commodity Name:** This name will be used to identify this commodity in the rest of the plan – the Storage Array Detail and the Map for example.
- □ **Description of the product(s):** in layman's terms, describe the products stored and what they are made of. Describe the nature of any plastic components. Description must be adequate to determine commodity classification using the Fire Code and NFPA 13.
- □ **Description of packaging material(s):** For liquids, include the size and type of container. For all materials include the size and materials of the packaging. Include all layers. Description must be adequate to determine commodity classification using the Fire Code and NFPA 13.
- □ **Description of containers(s):** Examples: wooden crates, cardboard boxes. Include all layers. Description must be adequate to determine commodity classification using the Fire Code and NFPA 13.
- □ **Are groups of packages banded:** These are groups of packages which are wrapped around the sides with plastic or paper, but which are open on the top and bottom.
- □ **Are groups of packages encapsulated:** These are groups of packages which are wrapped on both the sides and the top with plastic or paper.
- □ **Types of pallets:** Check all that apply
- □ **Non- Expanded Plastics:** Non-expanded plastics do not contain any air bubbles (i.e. they are not foam type plastics). Plastics are divided into three groups. If the plastics present fall into more than one group, list all applicable groups. The attached document **Commodity Classifications** provides the Fire Code definition of these groups and gives examples of each.
- □ **Expanded Plastics:** Expanded plastics contain air bubbles. Example: Styrafoam.
- □ **Commodity classification:** Combustible materials are divided into five categories depending on what they are made of and how they are packaged.
- □ **Managed as Group A Plastic per NFPA 13:** See NFPA 13 – Chapter 5, including the Appendix

Commodity Classification Information

The Fire Code divides commodities into four groups: Class I, II, III, IV, or high-hazard. Fire Code requirements are based upon this classification. NFPA 13 also divides commodities into four groups: Class I, II, III, IV and Group A plastics. Class I, II, III and IV are equivalent in the Fire Code and NFPA 13. The definitions for high-hazard and Group A plastics are similar but not identical. NFPA 13 – Chapter 5 and the associated Appendix sections provide detailed information about commodity classification. The lists below are from the Fire Code. The materials listed within each of these commodity classifications are assumed to be unmodified for improved combustibility characteristics. The use of flame-retarding modifiers, or the physical form of the material could change the classifications.

Class I Commodities

Class I commodities are essentially non-combustible products on wooden or nonexpendable polyethylene solid deck pallets, in ordinary corrugated cartons with or without single-thickness dividers, or in ordinary paper wrappings with or without pallets. Class I commodities are allowed to contain a limited amount of Group A plastics in accordance with Figure 3203.7.4 of the Fire Code (reproduced at the end of this document). Examples of Class I commodities include, but are not limited to, the following

- Alcoholic beverages not exceeding 20% alcohol
- Appliances, non-combustible, electrical
- Cement in bags
- Ceramics
- Dairy products in nonwax-coated containers (excluding bottles)
- Dry insecticides
- Food in noncombustible containers
- Fresh fruits and vegetables in non-plastic trays or containers
- Frozen foods
- Glass
- Glycol in metal cans
- Gypsum board
- Inert materials, bagged
- Insulation, noncombustible
- Non-combustible liquids in plastic containers of less than 5 gallon capacity
- Non-combustible metal products.

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Class II Commodities

Class II commodities are Class I products in slatted wooden crates, solid wooden boxes, multiple thickness paperboard cartons or equivalent combustible packaging materials with or without pallets. Class II commodities are allowed to contain a limited amount of Group A plastics in accordance with Figure 3203.7.4 of the Fire Code (reproduced at the end of this document). Examples of Class II commodities include, but are not limited to, the following

- Alcoholic beverages not exceeding 20% alcohol, in combustible containers
- Foods in combustible containers
- Incandescent for fluorescent light bulbs in cartons
- Thinly coated fine wire on reels or in cartons

Class III Commodities

Class III commodities are commodities of wood, natural fiber cloth, or Group C plastics or products thereof, with or without pallets. Products are allowed to contain limited amounts of Group A or B plastics, such as metal bicycles with plastic handles, pedals, seats, and tires. Groups A plastics shall be limited in accordance with in accordance with Figure 3203.7.4 of the Fire Code (reproduced at the end of this document). Examples of Class III commodities include, but are not limited to, the following

- Aerosol Level 1 (see Fire Code Chapter 51 and NFPA 30B)
- Combustible fiberboard
- Cork, baled
- Feed, bagged
- Food in plastic containers
- Furniture: wood, natural fiber, upholstered, non-plastic, wood or metal with plastic padded and covered arm rests
- Glycol in combustible containers not exceeding 25%
- Lubricating or hydraulic fluid in metal cans
- Lumber
- Mattresses, excluding foam rubber and foam plastics
- Noncombustible liquids in plastic containers having a capacity of more than 5 gallons
- Paints, oil base, in metal cans
- Paper, waste, baled
- Paper and pulp, horizontal storage, or vertical storage that is banded or protected with approved wrap
- Paper in cardboard boxes
- Pillows, excluding foam rubber and foam plastics
- Plastic-coated paper food containers
- Plywood
- Rags, baled
- Rugs, without foam backing
- Sugar, bagged
- Wood, baled
- Wood doors, frames and cabinets
- Yarns of natural fiber and viscose

Class IV Commodities

Class IV commodities are Class I, II, or II products containing Group A plastics in ordinary corrugated cartons and Class I, II and III products with Group A plastic packaging, with or without pallets. Group B plastics and free-flowing Group A plastics are also included in this class. The total amount of non-free flowing Group A plastic in accordance with Figure 3203.7.4 of the Fire Code (reproduced at the end of this document). Examples of Class IV commodities include, but are not limited to, the following

- Aerosol, Level 2 (see Fire Code Chapter 51 and NPFA 30B)
- Alcoholic beverages, exceeding 20 % but less than 80% alcohol, in cans or bottles in cartons
- Clothing, synthetic or nonviscose
- Combustible metal products (solid)
- Furniture, plastic upholstered
- Furniture, wood or metal with plastic covering and padding
- Glycol in combustible containers (Greater than 25% and less than 50%)
- Linoleum products

- Paints, oil base, in combustible containers
- Pharmaceutical, alcoholic elixirs, tonics, etc.
- Rugs, foam back
- Shingles, asphalt
- Thread or yarn, synthetic or nonviscose

High Hazard Commodities

High-hazard commodities are high-hazard products presenting special fire hazards beyond those of Class I, II, III, and IV. Group A plastics not otherwise classified are included in this class. Examples of high-hazard commodities include, but are not limited to, the following

- Aerosol, Level (see Fire Code Chapter 31 and NFPA 30B)
- Alcoholic beverages, exceeding 80 % alcohol in bottles or cartons
- Commodities of any class in plastic containers in carousel storage
- Flammable solids (except solid combustible metals)
- Glycol in combustible containers (50 % or greater)
- Lacquers, which dry by solvent evaporation, in metal cans or cartons
- Lubricating or hydraulic fluid in plastic containers
- Mattresses, foam rubber or foam plastics
- Pallets and flats which are idle combustible
- Paper and pulp, rolled, in vertical storage which is unbanded or not protected with an approved wrap
- Paper, asphalt, rolled, horizontal storage
- Paper, asphalt, rolled, vertical storage
- Pillow, foam rubber and foam plastics
- Pyroxylin
- Rubber tires
- Vegetable oil and butter in plastic containers

Classification of plastics

Group A plastics

Group A plastics are plastic materials having a heat of combustion that is much higher than that of ordinary combustibles, and a burning rate higher than that of Group B plastics. Examples of Group A plastics, include, but are not limited to, the following:

- ABS (acrylonitrile-butadiene-styrene copolymer)
- Acetal (polyformaldehyde)
- Acrylic (polymethyl methacrylate)
- Butyl rubber
- EPDM (ethylene propylene rubber)
- FRP (fiberglass-reinforced polyester)
- Natural rubber (expanded)
- Nitrile rubber (acrylonitrile butadiene rubber)
- PET or PETE (polyethylene terephthalate)
- Polybutadiene
- Polycarbonate

- Polyester elastomer
- Polyethylene
- Polypropylene
- Polystyrene (expanded and unexpanded)
- Polyurethane (expanded and unexpanded)
- PVC (polyvinyl chloride greater than 15 percent plasticized, e.g., coated fabric unsupported film)
- SAN (styrene acrylonitrile)
- SBR (styrene butadiene rubber)

Group B Plastics

Group B plastics are plastic materials having a heat of combustion and a burning rate higher than that of ordinary combustibles, but not as high as those of Group A plastics. Examples of Group B plastics include, but are not limited to, the following:

- Cellulosics (cellulose acetate, cellulose acetate butyrate, ethyl cellulose)
- Chloroprene rubber
- Fluoroplastics (ECTFE, ethylene-chlorotrifluoroethyl-ene copolymer; ETFE, ethylenetetrafluoroethylene copolymer; FEP, fluorinated ethylene-propylene copolymer)
- Natural rubber (non-expanded)
- Nylon (Nylon 6, Nylon 6/6)
- PVC (polyvinyl chloride greater than 5-percent, but not exceeding 15-percent plasticized)
- Silicone rubber

Group C Plastics

Group C plastics are plastic materials having a heat of combustion and a burning rate similar to those of ordinary combustibles. Examples of Group C plastics include, but are not limited to, the following:

- Fluoroplastics (PCTFE, polychlorotrifluoroethylene; PTFE, polytetrafluoroethylene)
- Melamine (melamine formaldehyde) henol VC (polyvinyl chloride, rigid or plasticized less than 5 percent, e.g., pipe, pipe fittings)
- PVDC (polyvinylidene chloride)
- PVDF (polyvinylidene fluoride)
- PVF (polyvinyl fluoride)
- Urea (urea formaldehyde)Mixed Commodities

Mixed Commodities

Unless otherwise specified in Chapter 32 of the California Fire Code, this section refers to mixed commodities involving Group A plastics only. Group C plastics are considered Class III commodities and Group B plastics are considered Class IV commodities, unless otherwise specified.

The percentage of plastics present determines the commodity classification. Please note that this percentage of plastics is based on individual pallet loads or cartons and is a function of the volume or weight of the packaging method for both expanded and non expanded plastics. The definitions for each are below.

PLASTICS, NON EXPANDED Those plastics with high densities, solid, or not otherwise categorized as expanded, such as polyethylene film, polystyrene toys, polyester and polystyrene plastic tote bins, polyethylene 55-gallon drums or smaller containers, etc.

PLASTICS, EXPANDED (FOAMED OR CELLULAR) Those plastics, the density of which is reduced by the presence of numerous small cavities (cells), interconnecting or not, dispersed throughout their mass. Examples include Styrofoam peanuts and cups.

The chart on the following page is used to determine the classification of commodities containing Group A plastics.

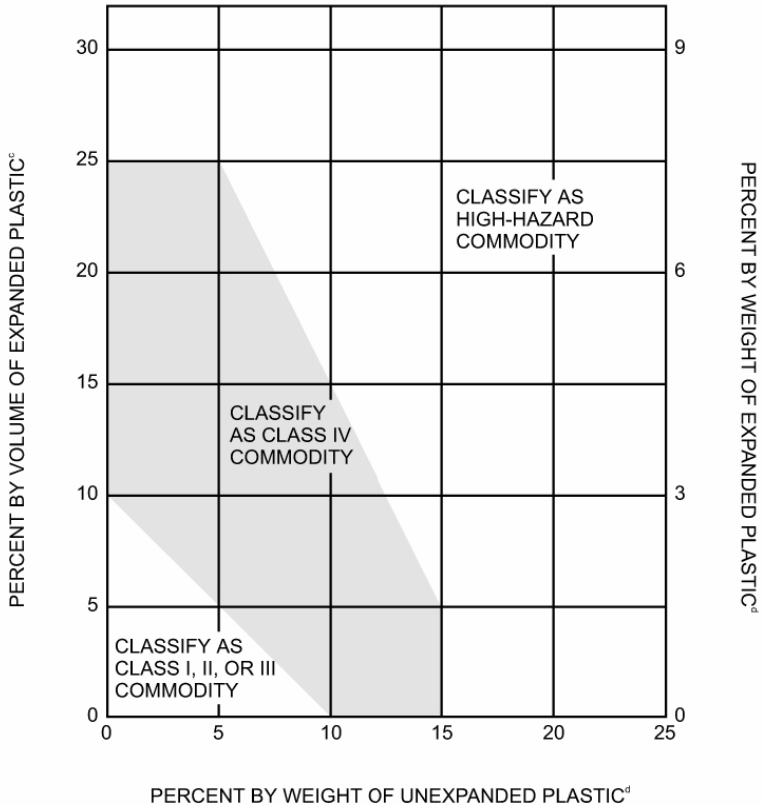

Figure 2303.7.4
Mixed Commodities.

a. This figure is intended to determine the commodity classification of a mixed commodity in a package, carton or on a pallet where plastics are involved.
b. The following is an example of how to apply the figure: A package containing a Class III commodity has 12-percent Group A expanded plastic by volume. The weight of the unexpanded Group A plastic is 10 percent. This commodity is classified as a Class IV commodity. If the weight of the unexpanded plastic is increased to 14 percent, the classification changes to a high-hazard commodity.

c. Percent by volume = $\frac{\text{Volume of plastic in pallet load}}{\text{Total volume of pallet load, including pallet}}$

d. Percent by weight = $\frac{\text{Weight of plastic in pallet load}}{\text{Total weight of pallet load, including pallet.}}$