

1301:7-7-23**High-piled combustible storage.**(A) Section 2301 General

(1) 2301.1 Scope. High-piled combustible storage shall be in accordance with this rule. In addition to the requirements of this rule, the following material-specific requirements shall apply:

(a) Aerosols shall be in accordance with rule 1301:7-7-28 of the Administrative Code.

(b) Flammable and combustible liquids shall be in accordance with rule 1301:7-7-34 of the Administrative Code.

(c) Hazardous materials shall be in accordance with rule 1301:7-7-27 of the Administrative Code.

(d) Storage of combustible paper records shall be in accordance with NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code.

(e) Storage of combustible fibers shall be in accordance with rule 1301:7-7-29 of the Administrative Code.

(f) Storage of miscellaneous combustible material shall be in accordance with rule 1301:7-7-03 of the Administrative Code.

(2) 2301.2 Permits. A permit shall be required as set forth in rule 1301:7-7-01 of the Administrative Code.

(3) 2301.3 Construction documents. At the time of building permit application for new structures designed to accommodate high-piled storage or for requesting a change of occupancy/use, and at the time of application for a storage permit, plans and specifications shall be submitted for review and approval. In addition to the information required by the building code as listed in rule 1301:7-7-47 of the Administrative Code, the storage permit submittal shall include the information specified in this paragraph. Following approval of the plans, a copy of the approved plans shall be maintained on the premises in an approved location. The plans shall include the following:

(a) Floor plan of the building showing locations and dimensions of high-piled storage areas.

(b) Usable storage height for each storage area.

(c) Number of tiers within each rack, if applicable.

(d) Commodity clearance between top of storage and the sprinkler deflector for each storage arrangement.

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- (e) Aisle dimensions between each storage array.
  - (f) Maximum pile volume for each storage array.
  - (g) Location and classification of commodities in accordance with paragraph (C)(2303) of this rule.
  - (h) Location of commodities which are banded or encapsulated.
  - (i) Location of required fire department access doors.
  - (j) Type of fire suppression and fire detection systems.
  - (k) Location of valves controlling the water supply of ceiling and in-rack sprinklers.
  - (l) Type, location and specifications of smoke removal and curtain board systems.
  - (m) Dimension and location of transverse and longitudinal flue spaces.
  - (n) Additional information regarding required design features, commodities, storage arrangement and fire protection features within the high-piled storage area shall be provided at the time of permit, when required by the fire code official.
- (4) 2301.4 Evacuation plan. When required by the fire code official, an evacuation plan for public accessible areas and a separate set of plans indicating location and width of aisles, location of exits, exit access doors, exit signs, height of storage, and location of hazardous materials shall be submitted at the time of permit application for review and approval. Following approval of the plans, a copy of the approved plans shall be maintained on the premises in an approved location.

#### (B) Section 2302 Definitions

- (1) 2302.1 Definitions. The following words and terms shall, for the purposes of this rule and as used elsewhere in this code, have the meanings shown herein.

"Array." The configuration of storage. Characteristics considered in defining an array include the type of packaging, flue spaces, height of storage and compactness of storage.

"Array, closed." A storage configuration having a 6-inch (152 mm) or smaller width vertical flue space that restricts air movement through the stored commodity.

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"Automated rack storage." Automated rack storage is a stocking method whereby the movement of pallets, products, apparatus or systems are automatically controlled by mechanical or electronic devices.

"Bin box." A five-sided container with the open side facing an aisle. Bin boxes are self-supporting or supported by a structure designed so that little or no horizontal or vertical space exists around the boxes.

"Commodity." A combination of products, packing materials and containers.

"Draft curtain." A structure arranged to limit the spread of smoke and heat along the underside of the ceiling or roof.

"Early suppression fast-response (ESFR) sprinkler." A sprinkler listed for early suppression fast-response performance.

"Expanded plastic." A foam or cellular plastic material having a reduced density based on the presence of numerous small cavities or cells dispersed throughout the material.

"Extra-high rack combustible storage." Storage on racks of Class I, II, III or IV commodities which exceed 40 feet (12 192 mm) in height and storage on racks of high-hazard commodities which exceed 30 feet (9144 mm) in height.

"High-piled combustible storage." 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 (3658 mm) 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 (1829 mm) in height.

"High-piled storage area." An area within a building which is designated, intended, proposed or actually used for high-piled combustible storage.

"Longitudinal flue space." The flue space between rows of storage perpendicular to the direction of loading.

"Manual stocking methods." Stocking methods utilizing ladders or other nonmechanical equipment to move stock.

"Mechanical stocking methods." Stocking methods utilizing motorized vehicles or hydraulic jacks to move stock.

"Shelf storage." Storage on shelves less than 30 inches (762 mm) deep with the distance between shelves not exceeding 3 feet (914 mm) vertically. For

other shelving arrangements, see the requirements for rack storage.

"Solid shelving." Shelving that is solid, slatted or of other construction located in racks and which obstructs sprinkler discharge down into the racks.

"Transverse flue space." The space between rows of storage parallel to the direction of loading.

(C) Section 2303 Commodity classification

(1) 2303.1 Classification of commodities. Commodities shall be classified as Class I, II, III, IV or high hazard in accordance with this paragraph. Materials listed within in each commodity classification are assumed to be unmodified for improved combustibility characteristics. Use of flame-retarding modifiers or the physical form of the material could change the classification. See paragraph (C)(7)(2303.7) of this rule for classification of Group A, B and C plastics.

(2) 2303.2 Class I commodities. Class I commodities are essentially noncombustible products on wooden or nonexpanded 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 paragraph (C)(7)(d)(2303.7.4) of this rule. Examples of Class I commodities include, but are not limited to, the following:

Alcoholic beverages not exceeding 20-per cent alcohol

Appliances noncombustible, electrical

Cement in bags

Ceramics

Dairy products in nonwax-coated containers (excluding bottles)

Dry insecticides

Foods in noncombustible containers

Fresh fruits and vegetables in nonplastic trays or containers

Frozen foods

Glass

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Glycol in metal cans

Gypsum board

Inert materials, bagged

Insulation, noncombustible

Noncombustible liquids in plastic containers having less than a 5-gallon (19 L) capacity

Noncombustible metal products

- (3) 2303.3 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 material with or without pallets. Class II commodities are allowed to contain a limited amount of Group A plastics in accordance with paragraph (C)(7)(d)(2303.7.4) of this rule. Examples of Class II commodities include, but are not limited to, the following:

Alcoholic beverages not exceeding 20-per cent alcohol, in combustible containers

Foods in combustible containers

Incandescent or fluorescent light bulbs in cartons

Thinly coated fine wire on reels or in cartons

- (4) 2303.4 Class III commodities. Class III commodities are commodities of wood, paper, 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. Group A plastics shall be limited in accordance with paragraph (C)(7)(d)(2303.7.4) of this rule. Examples of Class III commodities include, but are not limited to, the following:

Aerosol, Level 1 (see rule 1301:7-7-28 of the Administrative Code)

Combustible fiberboard

Cork, baled

Feed, bagged

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Fertilizers, bagged

Food in plastic containers

Furniture: wood, natural fiber, upholstered, nonplastic, wood or metal with plastic-padded and covered arm rests

Glycol in combustible containers not exceeding 25 per cent

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 (19 L)

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

(5) 2303.5 Class IV commodities. Class IV commodities are Class I, II or III products containing Group A plastics in ordinary corrugated cartons and

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Class I, II and III products, with Group A plastic packaging, with or without pallets. Group B plastics and free-flowing Group A plastics shall be in accordance with paragraph (C)(7)(d)(2303.7.4) of this rule. Examples of Class IV commodities include, but are not limited to, the following:

Aerosol, Level 2 (see rule 1301:7-7-28 of the Administrative Code)

Alcoholic beverages, exceeding 20-per cent but less than 80-per cent 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 per cent and less than 50 per cent)

Linoleum products

Paints, oil base in combustible containers

Pharmaceutical, alcoholic elixirs, tonics, etc.

Rugs, foam back

Shingles, asphalt

Thread or yarn, synthetic or nonviscose

(6) 2303.6 High-hazard commodities. High-hazard commodities are high-hazard products presenting special fire hazards beyond those of Class I, II, III or 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 3 (see rule 1301:7-7-28 of the Administrative Code)

Alcoholic beverages, exceeding 80-per cent 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 per cent or greater)

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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

Pillows, foam rubber and foam plastics

Pyroxylin

Rubber tires

Vegetable oil and butter in plastic containers

(7) 2303.7 Classification of plastics. Plastics shall be designated as Group A, B or C in accordance with paragraphs (C)(7)(a)(2303.7.1) to (C)(7)(d)(2303.7.4) of this rule.

(a) 2303.7.1 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)

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Nitrile rubber (acrylonitrile butadiene rubber)

PET or PETE (polyethylene terephthalate)

Polybutadiene

Polycarbonate

Polyester elastomer

Polythylene

Polypropylene

Polystyrene (expanded and unexpanded)

Polyurethane (expanded and unexpanded)

PVC (polyvinyl chloride greater than 15 per cent plasticized, e.g., coated fabric unsupported film)

SAN (styrene acrylonitrile)

SBR (styrene butadiene rubber)

(b) 2303.7.2 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-chlorotrifluoroethylene copolymer; ETFE, ethylene-tetrafluoroethylene copolymer; FEP, fluorinated ethylene-propylene copolymer)

Natural rubber (nonexpanded)

Nylon (Nylon 6, Nylon 6/6)

PVC (polyvinyl chloride greater than 5-per cent, but not exceeding 15-per cent plasticized)

Silicone rubber

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(c) 2303.7.3 Group C plastics. Group C plastics are plastic materials having a heat of combustion and 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)

Phenol

PVC (polyvinyl chloride, rigid or plasticized less than 5-per cent, e.g., pipe, pipe fittings)

PVDC (polyvinylidene chloride)

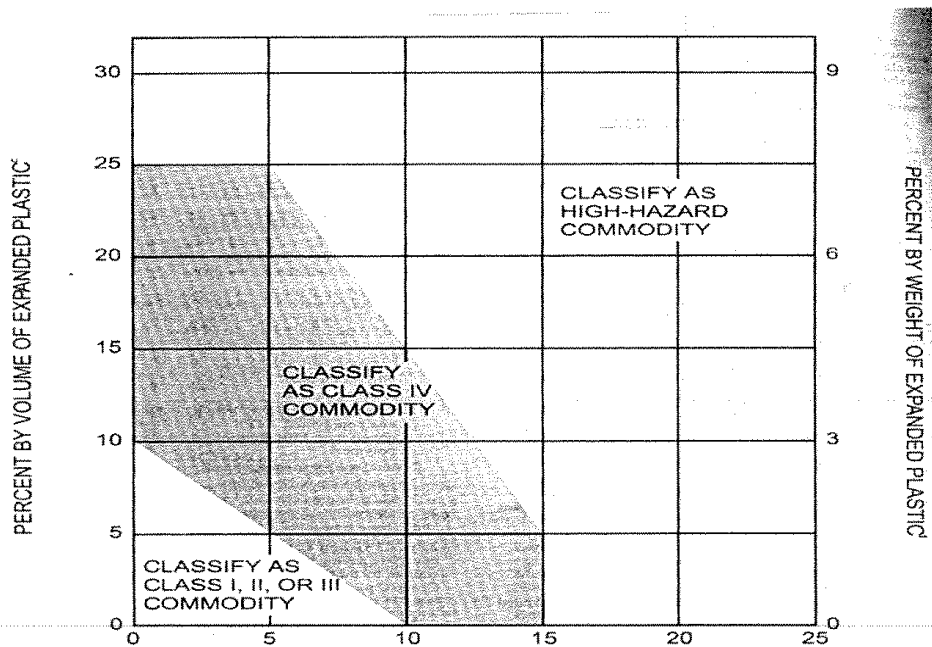
PVDF (polyvinylidene fluoride)

PVF (polyvinyl fluoride)

Urea (urea formaldehyde)

(d) 2303.7.4 Limited quantities of Group A plastics in mixed commodities. Figure (C)(7)(d)(2303.7.4) of this rule shall be used to determine the quantity of Group A plastics allowed to be stored in a package or carton or on a pallet without increasing the commodity classification.

**Figure 2303.7.4**  
**Mixed commodities<sup>a,b</sup>**



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-per cent Group A expanded plastic by volume. The weight of the unexpanded Group A plastic is 10 per cent. This commodity is classified as a Class IV commodity. If the weight of the unexpanded plastic is increased to 14 per cent, the classification changes to a high-hazard commodity.

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Volume of plastic in pallet load

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

Weight of plastic in pallet load

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

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(D) Section 2304 Designation of high-piled storage areas

- (1) 2304.1 General. High-piled storage areas, and portions of high-piled storage areas intended for storage of a different commodity class than adjacent areas, shall be designed and specifically designated to contain Class I, Class II, Class III, Class IV or high-hazard commodities. The designation of a high-piled combustible storage area, or portion thereof intended for storage of a different commodity class, shall be based on the highest hazard commodity class stored except as provided in paragraph (D)(2)(2304.2) of this rule.
- (2) 2304.2 Designation based on engineering analysis. The designation of a high-piled combustible storage area, or portion thereof, is allowed to be based on a lower hazard class than that of the highest class of commodity stored when a limited quantity of the higher hazard commodity has been demonstrated by engineering analysis to be adequately protected by the automatic sprinkler system provided. The engineering analysis shall consider the ability of the sprinkler system to deliver the higher density required by the higher hazard commodity. The higher density shall be based on the actual storage height of the pile or rack and the minimum allowable design area for sprinkler operation as set forth in the density/area figures provided in NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code. The contiguous area occupied by the higher hazard commodity shall not exceed 120 square feet (11 m<sup>2</sup>), and additional areas of higher hazard commodity shall be separated from other such areas by 25 feet (7620 mm) or more. The sprinkler system shall be capable of delivering the higher density over a minimum area of 900 square feet (84 m<sup>2</sup>) for wet pipe systems and 1,200 square feet (11 m<sup>2</sup>) for dry pipe systems. The shape of the design area shall be in accordance with paragraph (C)(903) of rule 1301:7-7-09 of the Administrative Code.

(E) Section 2305 Housekeeping and maintenance

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- (1) 2305.1 Rack structures. The structural integrity of racks shall be maintained.
- (2) 2305.2 Ignition sources. Clearance from ignition sources shall be provided in accordance with paragraph (E)(305) of rule 1301:7-7-03 of the Administrative Code.
- (3) 2305.3 Smoking. Smoking shall be prohibited. Approved "No Smoking" signs shall be conspicuously posted in accordance with paragraph (J)(310) of rule 1301:7-7-03 of the Administrative Code.
- (4) 2305.4 Aisle maintenance. When restocking is not being conducted, aisles shall be kept clear of storage, waste material and debris. Fire department access doors, aisles and exit doors shall not be obstructed. During restocking operations using manual stocking methods, a minimum unobstructed aisle width of 24 inches (610 mm) shall be maintained in 48-inch (1219 mm) or small aisles, and a minimum unobstructed aisle width of one-half of the required aisle width shall be maintained in aisles greater than 48 inches (1219 mm). During mechanical stocking operations, a minimum unobstructed aisle width of 44 inches (1118 mm) shall be maintained in accordance with paragraph (F)(9)(2306.9) of this rule.
- (5) 2305.5 Pile dimension and height limitations. Pile dimensions and height limitations shall comply with paragraph (G)(3)(2307.3) of this rule.
- (6) 2305.6 Designation of storage heights. Where required by the fire code official, a visual method of indicating the maximum allowable storage height shall be provided.
- (7) 2305.7 Arrays. Arrays shall comply with paragraph (G)(4)(2307.4) of this rule.
- (8) 2305.8 Flue spaces. Flue spaces shall comply with paragraph (H)(3)(2308.3) of this rule.

(F) Section 2306 General fire protection and life safety features

- (1) 2306.1 General. Fire protection and life safety features for high-piled storage areas shall be in accordance with paragraphs (F)(2)(2306.2) to (F)(10)(2306.10) of this rule.
- (2) 2306.2 Extent and type of protection. Where required by Table 2306.2 of this rule, fire detection systems, smoke and heat removal, draft curtains and automatic sprinkler design densities shall extend the lesser of 15 feet (4572 mm) beyond the high-piled storage area or to a permanent partition. Where portions of high-piled storage areas have different fire protection requirements because of commodity, method of storage or storage height, the fire protection features required by Table 2306.2 of this rule within this area

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shall be based on the most restrictive design requirements.

**Table 2306.2**  
**General fire protection and life safety requirements**

Commodity class	Size of high-piled storage area (square feet) (see paragraphs (F)(2)(2306.2) and (F)(4)(2306.4) of this rule)	All storage areas (see paragraphs (F)(2306), (G)(2307) and (H)(2308) of this rule) <sup>b</sup>						Solid-piled storage, shelf storage and palletized storage (see paragraph (G)(3)(2307.3) of this rule)		
		Automatic fire extinguishing system (see paragraph (F)(4)(2306.4) of this rule)	Fire detection system (see paragraph (F)(5)(2306.5) of this rule)	Building access (see paragraph (F)(6)(2306.6) of this rule)	Smoke and heat removal (see paragraph (F)(7)(2306.7) of this rule)	Draft curtains (see paragraph (E)(7)(2306.7) of this rule)	Maximum pile dimension <sup>c</sup> (feet)	Maximum permissible storage height <sup>c</sup> (feet)	Maximum pile volume (cubic feet)	
I-IV	0-500	Not required <sup>a</sup>	Not required	Not required <sup>d</sup>	Not required	Not required	Not required	Not required	Not required	Not required
	501-2,500	Not required <sup>a</sup>	Yes <sup>f</sup>	Not required <sup>d</sup>	Not required	Not required	100	40	100,000	100,000
	2,501-12,000 Public accessible	Yes	Not required	Not required <sup>d</sup>	Not required	Not required	100	40	400,000	400,000
	2,501-12,000 Nonpublic accessible (Option 1)	Yes	Not required	Not required <sup>d</sup>	Not required	Not required	100	40	400,000	400,000
	2,501-12,000 Nonpublic accessible (Option 2)	Not required <sup>a</sup>	Yes	Yes	Yes <sup>f</sup>	Yes <sup>f</sup>	100	30 <sup>f</sup>	200,000	200,000
	12,001-20,000	Yes	Not required	Yes	Yes <sup>f</sup>	Not required	100	40	400,000	400,000
High Hazard	20,001-500,000	Yes	Not required	Yes	Yes <sup>f</sup>	Not required	100	40	400,000	400,000
	Greater than 500,000 <sup>g</sup>	Yes	Not required	Yes	Yes <sup>f</sup>	Not required	100	40	400,000	400,000
	0-500	Not required <sup>a</sup>	Not required	Not required <sup>d</sup>	Not required	Not required	50	Not required	Not required	Not required
	501-2,500 Public accessible	Yes	Not required	Not required <sup>d</sup>	Not required	Not required	50	30	75,000	75,000
	501-2,500 Nonpublic accessible (Option 1)	Yes	Not required	Not required <sup>d</sup>	Not required	Not required	50	30	75,000	75,000
	501-2,500 Nonpublic accessible (Option 2)	Not required <sup>a</sup>	Yes	Yes	Yes <sup>f</sup>	Yes <sup>f</sup>	50	20	50,000	50,000
	2,501-300,000	Yes	Not required	Yes	Yes <sup>f</sup>	Not required	50	30	75,000	75,000
	300,001-500,000 <sup>g,h</sup>	Yes	Not required	Yes	Yes <sup>f</sup>	Not required	50	30	75,000	75,000

For SI: 1 foot = 304.8 mm, 1 cubic foot = 0.02832 m<sup>3</sup>, 1 square foot = 0.0929 m<sup>2</sup>.

a. When automatic sprinklers are required for reasons other than those in this rule, the portion of the sprinkler system protecting the high-piled storage area shall be designed and installed in accordance with paragraphs (G)(2307) and (H)(2308) of this rule.

b. For aisles, see paragraph (F)(9)(2306.9) of this rule.

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c. Piles shall be separated by aisles complying with paragraph (F)(9)(2306.9) of this rule.

d. For storage in excess of the height indicated, special fire protection shall be provided in accordance with Note g when required by the fire code official. See also rule 1301:7-7-28 and rule 1301:7-7-34 of the Administrative Code for special limitations for aerosols and flammable and combustible liquids, respectively.

e. Paragraph (C)(503) of rule 1301:7-7-05 of the Administrative Code shall apply for fire apparatus access.

f. For storage exceeding 30 feet in height, Option 1 shall be used.

g. Special fire protection provisions including, but not limited to, fire protection of exposed steel columns; increased sprinkler density; additional in-rack sprinklers, without associated reductions in ceiling sprinkler density; or additional fire department hose connections shall be provided when required by the fire code official.

h. High-piled storage areas shall not exceed 500,000 square feet. A 2-hour fire wall constructed in accordance with the building code as listed in rule 1301:7-7-47 of the Administrative Code shall be used to divide high-piled storage areas exceeding 500,000 square feet in area.

i. Not required when an automatic fire-extinguishing system is designed and installed to protect the high-piled storage area in accordance with paragraphs (G)(2307) and (H)(2308) of this rule.

j. Not required when storage areas are protected by early suppression fast response (ESFR) sprinkler systems installed in accordance with NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code.

(3) 2306.3 Separation of high-piled storage areas. High-piled storage areas shall be separated from other portions of the building where required by paragraphs (F)(3)(a)(2306.3.1) to (F)(3)(b)(ii)(2306.3.2.2) of this rule.

(a) 2306.3.1 Separation from other uses. Mixed occupancies shall be separated in accordance with the building code as listed in rule 1301:7-7-47 of the Administrative Code.

(b) 2306.3.2 Multiple high-piled storage areas. Multiple high-piled storage areas shall be in accordance with paragraph (F)(3)(b)(i)(2306.3.2.1) or (F)(3)(b)(ii)(2306.3.2.2) of this rule.

(i) 2306.3.2.1 Aggregate area. The aggregate of all high-piled storage

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areas within a building shall be used for application of Table 2306.2 of this rule unless such areas are separated from each other by 1-hour fire barrier walls constructed in accordance with the building code as listed in rule 1301:7-7-47 of the Administrative Code. Openings in such walls shall be protected by opening protective assemblies having a 1-hour fire protection rating.

- (ii) 2306.3.2.2 Multiclass high-piled storage areas. High-piled storage areas classified as Class I through IV not separated from high-piled storage areas classified as high hazard shall utilize the aggregate of all high-piled storage areas as high hazard for purposes of the application of Table 2306.2 of this rule. To be considered as separated, 1-hour fire barrier walls shall be constructed in accordance with the building code as listed in rule 1301:7-7-47 of the Administrative Code. Openings in such walls shall be protected by opening protective assemblies having a 1-hour fire protection rating.

Exception: As provided for in paragraph (D)(2)(2304.2) of this rule.

- (4) 2306.4 Automatic sprinklers. Automatic sprinkler systems shall be provided in accordance with paragraphs (G)(2307), (H)(2308) and (I)(2309) of this rule.

- (5) 2306.5 Fire detection. Where fire detection is required by Table 2306.2 of this rule, an approved automatic fire detection system shall be installed throughout the high-piled storage area. The system shall be monitored and be in accordance with paragraph (G)(907) of rule 1301:7-7-09 of the Administrative Code.

- (6) 2306.6 Building access. Where building access is required by Table 2306.2 of this rule, fire apparatus access roads in accordance with paragraph (C)(503) of rule 1301:7-7-05 of the Administrative Code shall be provided within 150 feet (45 720 mm) of all portions of the exterior walls of buildings used for high-piled storage.

Exception: Where fire apparatus access roads cannot be installed because of topography, railways, waterways, nonnegotiable grades or other similar conditions, the fire code official is authorized to require additional fire protection.

- (a) 2306.6.1 Access doors. Where building access is required by Table 2306.2 of this rule, fire department access doors shall be provided in accordance with this paragraph. Access doors shall be accessible without the use of a ladder.

- (i) 2306.6.1.1 Number of doors required. A minimum of one access

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door shall be provided in each 100 lineal feet (30 480 mm), or fraction thereof, of the exterior walls that face required fire apparatus access roads. The required access doors shall be distributed such that the lineal distance between adjacent access doors does not exceed 100 feet (30 480 mm).

(ii) 2306.6.1.2 Door size and type. Access doors shall not be less than 3 feet (914 mm) in width and 6 feet 8 inches (2032 mm) in height. Roll-up doors shall not be used unless approved.

(iii) 2306.6.1.3 Locking devices. Only approved locking devices shall be used.

(7) 2306.7 Smoke and heat removal. Where smoke and heat removal are required by Table 2306.2 of this rule, smoke and heat vents shall be provided in accordance with paragraph (J)(910) of rule 1301:7-7-09 of the Administrative Code. Where draft curtains are required by Table 2306.2 of this rule, they shall be provided in accordance with paragraph (J)(3)(d)(910.3.4) of rule 1301:7-7-09 of the Administrative Code.

(8) 2306.8 Fire department hose connections. Where exit passageways are required by the building code as listed in rule 1301:7-7-47 of the Administrative Code for egress, a Class I standpipe system shall be provided in accordance with paragraph (E)(905) of rule 1301:7-7-09 of the Administrative Code.

(9) 2306.9 Aisles. Aisles providing access to exits and fire department access doors shall be provided in high-piled storage areas exceeding 500 square feet (46 m<sup>2</sup>), in accordance with paragraphs (F)(9)(a)(2306.9.1) to (F)(9)(c)(2306.9.3) of this rule. Aisles separating storage piles or racks shall comply with NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code. Aisles shall also comply with rule 1301:7-7-10 of the Administrative Code.

Exception: Where aisles are precluded by rack storage systems, alternate methods of access and protection are allowed when approved.

(a) 2306.9.1 Width. Aisle width shall be in accordance with paragraphs (F)(9)(a)(i)(2306.9.1.1) and (F)(9)(a)(ii)(2306.9.1.2) of this rule.

Exceptions:

1. Aisles crossing rack structures or storage piles, which are used only for employee access, shall be a minimum of 24 inches (610 mm) wide.

2. Aisles separating shelves classified as shelf storage shall be a minimum of 30 inches (762 mm) wide.

(i) 2306.9.1.1 Sprinklered buildings. Aisles in sprinklered buildings

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shall be a minimum of 44 inches (1118 mm) wide. Aisles shall be a minimum of 96 inches (2438 mm) wide in high-piled storage areas exceeding 2,500 square feet (232 m<sup>2</sup>) in area, that are accessible to the public and designated to contain high-hazard commodities.

Exception: Aisles in high-piled storage areas exceeding 2,500 square feet (232 m<sup>2</sup>) in area, that are accessible to the public and designated to contain high-hazard commodities, are protected by a sprinkler system designed for multiple-row racks of high-hazard commodities shall be a minimum of 44 inches (1118 mm) wide.

Aisles shall be a minimum of 96 inches (2438 mm) wide in areas accessible to the public where mechanical stocking methods are used.

(ii) 2306.9.1.2 Nonsprinklered buildings. Aisles in nonsprinklered buildings shall be a minimum of 96 inches (2438 mm) wide.

(b) 2306.9.2 Clear height. The 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 (2032 mm) above the finished floor level, provided that such supports do not interfere with fire department hose stream trajectory.

(c) 2306.9.3 Dead ends. Dead-ends aisles shall be in accordance with rule 1301:7-7-10 of the Administrative Code.

(10) 2306.10 Portable fire extinguishers. Portable fire extinguishers shall be provided in accordance with paragraph (F)(906) of rule 1301:7-7-09 of the Administrative Code.

(G) Section 2307 Solid-piled and shelf storage

(1) 2307.1 General. Shelf storage and storage in solid piles, solid piles on pallets and bin box storage in bin boxes not exceeding 5 feet (1524 mm) in any dimension, shall be in accordance with paragraph (F)(2306) of this rule and this paragraph.

(2) 2307.2 Fire protection. Where automatic sprinklers are required by Table 2306.2 of this rule, an approved automatic sprinkler system shall be installed throughout the building or to 1-hour fire barrier walls constructed in accordance with the building code as listed in rule 1301:7-7-47 of the Administrative Code. Openings in such walls shall be protected by opening protective assemblies having 1-hour fire protection ratings. The design and installation of the automatic sprinkler system and other applicable fire protection shall be in accordance with the building code and NFPA 13 as

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listed in rule 1301:7-7-47 of the Administrative Code.

- (a) 2307.2.1 Shelf storage. Shelf storage greater than 12 feet (3658 mm) but less than 15 feet (4572 mm) in height shall be in accordance with the fire protection requirements set forth in NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code. Shelf storage 15 feet (4572 mm) or more in height shall be protected in an approved manner with special fire protection, such as in-rack sprinklers.
- (3) 2307.3 Pile dimension and height limitations. Pile dimensions, the maximum permissible storage height and pile volume shall be in accordance with Table 2306.2 of this rule.
- (4) 2307.4 Array. Where an automatic sprinkler system design utilizes protection based on a closed array, array clearances shall be provided and maintained as specified by the standard used.

(H) Section 2308 Rack storage

- (1) 2308.1 General. Rack storage shall be in accordance with paragraph (F)(2306) of this rule and this paragraph. Bin boxes exceeding 5 feet (1524 mm) in any dimension shall be regulated as rack storage.
- (2) 2308.2 Fire protection. Where automatic sprinklers are required by Table 2306.2 of this rule, an approved automatic sprinkler system shall be installed throughout the building or to 1-hour fire barrier walls constructed in accordance with the building code as listed in rule 1301:7-7-47 of the Administrative Code. Openings in such walls shall be protected by opening protective assemblies having 1-hour fire protection ratings. The design and installation of automatic sprinkler system and other applicable fire protection shall be in accordance with paragraph (C)(3)(a)(i)(903.3.1.1) of rule 1301:7-7-09 of the Administrative Code and the building code as listed in rule 1301:7-7-47 of the Administrative Code.
- (a) 2308.2.1 Plastic pallets and shelves. Storage on plastic pallets and plastic shelves shall be protected by approved specially engineered fire protection systems.
- Exception: Plastic pallets listed and labeled in accordance with UL 2335 as listed in rule 1301:7-7-47 of the Administrative Code shall be treated as wood pallets for determining required sprinkler protection.
- (b) 2308.2.2 Racks with solid shelving. Racks with solid shelving having an area greater than 32 square feet (3 m<sup>2</sup>), measured between approved flue spaces at all four edges of the shelf, shall be in accordance with this paragraph.

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Exceptions:

1. Racks with mesh, grated, slatted or similar shelves having uniform openings not more than 6 inches (152 mm) apart, composed of at least 50 per cent of overall shelf area, and with approved flue spaces are allowed to be treated as racks without solid shelves.

2. Racks used for the storage of combustible paper records, with solid shelving, shall be in accordance with NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code.

(i) 2308.2.2.1 Fire protection. Fire protection for racks with solid shelving shall be in accordance with NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code.

(3) 2308.3 Flue spaces. Flue spaces shall be provided in accordance with Table 2308.3 of this rule. Required flue spaces shall be maintained.

**Table 2308.3**  
**Required flue spaces for rack storage**

Rack configuration	Automatic sprinkler protection		Sprinkler at the ceiling with or without minimum in-rack sprinklers			In-rack sprinklers at every tier	Non-sprinklered
			< 25 feet				
	Storage height		Option 1	Option 2	>25 feet	Any height	Any height
Single-row rack	Transverse Flue space	Size <sup>b</sup>	3 inches	Not applicable	3 inches	Not required	Not required
		Vertically aligned	Not required	Not applicable	Yes	Not applicable	Not required
	Longitudinal flue space		Not required	Not applicable	Not required	Not required	Not required
Double-row rack	Transverse Flue space	Size <sup>b</sup>	6 inches <sup>a</sup>	3 inches	3 inches	Not required	Not required
		Vertically aligned	Not required	Not required	Yes	Not applicable	Not required
	Longitudinal flue space		Not required	6 inches	6 inches	Not required	Not required
Multi-row rack	Transverse Flue space	Size <sup>b</sup>	6 inches	Not applicable	6 inches	Not required	Not required
		Vertically aligned	Not required	Not applicable	Yes	Not applicable	Not required
	Longitudinal flue space		Not required	Not applicable	Not required	Not required	Not required

For SI: 1 inch = 25.4 mm, 1 foot = 308.4 mm.

a. Three-inch transverse flue spaces shall be provided at least every 10 feet where ESFR sprinkler protection is provided.

b. Random variations are allowed, provided that the configuration does not obstruct water penetration.

(4) 2308.4 Column protection. Steel building columns shall be protected in

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accordance with NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code.

(5) 2308.5 Extra-high-rack storage systems. Approval of the fire code official shall be obtained prior to installing extra-high-rack combustible storage.

(a) 2308.5.1 Fire protection. Buildings with extra-high-rack combustible storage shall be protected with a specially engineered automatic sprinkler system. Extra-high-rack combustible storage shall be provided with additional special fire protection, such as separation from other buildings and additional built-in fire protection features and fire department access, when required by the fire code official.

(I) Section 2309 Automated storage

(1) 2309.1 General. Automated storage shall be in accordance with this paragraph.

(2) 2309.2 Automatic sprinklers. Where automatic sprinklers are required by Table 2306.2 of this rule, the building shall be equipped throughout with an approved automatic sprinkler system in accordance with paragraph (C)(3)(a)(i)(903.3.1.1) of rule 1301:7-7-09 of the Administrative Code.

(3) 2309.3 Carousel storage. High-piled storage areas having greater than 500 square feet (46 m<sup>2</sup>) of carousel storage shall be provided with automatic shutdown in accordance with one of the following:

(a) An automatic smoke detection system installed in accordance with paragraph (G)(907) of rule 1301:7-7-09 of the Administrative Code, with coverage extending 15 feet (4575 mm) in all directions beyond unenclosed carousel storage systems and which sounds a local alarm at the operator's station and stops the carousel storage system upon the activation of a single detector.

(b) An automatic smoke detection system installed in accordance with paragraph (G)(907) of rule 1301:7-7-09 of the Administrative Code and within enclosed carousel storage systems, which sounds a local alarm at the operator's station and stops the carousel storage system upon the activation of a single detector.

(c) A single dead-man-type control switch that allows the operation of the carousel storage system only when the operator is present. The switch shall be in the same room as the carousel storage system and located to provide for observation of the carousel system.

(4) 2309.4 Automated rack storage. High-piled storage areas with automated rack storage shall be provided with a manually activated emergency shutdown switch for use by emergency personnel. The switch shall be clearly identified

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and shall be in a location approved by the fire code official.

(J) Section 2310 Specialty storage

- (1) 2310.1 General. Records storage facilities used for the rack or shelf storage of combustible paper records greater than 12 feet (3658 mm) in height shall be in accordance with paragraphs (F)(2306) and (H)(2308) of this rule and NFPA 13 as listed in rule 1301:7-7-47 of the Administrative Code. Palletized storage records shall be in accordance with paragraph (G)(2307) of this rule.



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