Requirements for the protection of High-Piled Combustible Storage (HPCS)

Effective Date: January 2014

1.0 GENERAL:

1.1 **PURPOSE** -The intent of this guideline is to provide the requirements for the protection of high-piled combustible storage (HPCS) for a variety of commodities. The following requirements will ensure that the minimum measures required by code have been taken to provide for public safety and that the required protection of these commodities has been designed in accordance with Chapter 32 of the 2013 California Fire Code (CFC), Chapter 12 of the 2013 NFPA 13, and other referenced standards.

1.2 **Parameters** -The commodity classification and storage parameters for the rack areas are required prior to issuing a construction permit in order to determine the adequacy of the existing fire sprinkler system. Provide an analysis by a qualified professional that classifies the commodities. The analysis shall specify the minimum criteria for both the overhead and rack sprinkler systems based on the type of commodity and storage height as per the 2013 California Fire Code (CFC) and NFPA 13, 2013 edition. Provide construction documents as per CFC Section 3201.3.

1.3 **Technical Assistance** -Due to the complexity of the designs specified within the CFC and adopted standards, it may be necessary to obtain the service of a fire protection design professional to assist with developing a protection scheme that meets the requirements of the CFC and other applicable regulations.

2.0 DEFINITIONS:

2.1 This guideline provides the requirements for all HPCS within the City of San Jose. For the purposes of this guideline, certain terms are defined as follows:

2.1.1 **Commodity** -A combination of products, packing materials and containers.

2.1.2 **Commodity Classification** -Commodities shall be classified as Class I, II, III, IV, or High Hazard, in accordance with CFC Chapter 32, Section 3203. Plastics shall be classified as Group A, B, or C in accordance with CFC Chapter 32. To determine the proper commodity classification of products with limited quantities of Group A plastics in mixed commodities, use CFC Figure 3203.7.4. This figure identifies the quantity of Group A plastics allowed to be stored in a package, carton, or on a pallet without increasing the hazard and commodity classification to "high hazard." The designation and protection features of a high-piled combustible storage area intended for storage of different commodity classes shall be based on the highest hazard commodity stored, except as otherwise provided for by engineering analysis in CFC 3204.2.

2.1.3 **High-Piled Combustible Storage** -The storage of combustible materials in closely packed piles, on pallets, in racks, or on shelves where the top of storage is greater than 12 feet in height. High-piled combustible storage also includes certain high hazard commodities, such as rubber tires, Group A plastics, flammable and combustible liquids, idle pallets, and similar commodities where the top of storage is greater than six feet in height.

2.1.4 **High-Piled Storage Area** -An area within a building that is designated, intended, proposed, or actually used for high-piled combustible storage. For purposes of selecting the applicable fire protection requirement row in Table 3206.2:

2.1.4.1 This area shall include the "footprint" of the actual storage array (racks, shelves, fixtures, or pallets), inclusive of aisles within the storage area(s). When individual storage arrays are separated by less than 15 foot spaces, the spaces shall be considered aisles and shall be included in a single storage area footprint. When individual storage arrays are separated by more than 15 foot spaces, the individual arrays shall be considered separate storage areas with their own footprint calculation.

2.1.4.2 Each storage area shall also include a 48 inch perimeter aisle calculated in the footprint. This additional perimeter aisle is not required for areas that abut to a wall.

2.1.4.3 For multiple storage areas within a building, the aggregate of all high-piled storage areas shall be used for selecting the applicable row in Table 3206.2, unless such areas are separated from each other by a one hour rated fire barrier wall constructed in accordance with Section 706 of the 2013 California Building Code (CBC). Openings in such walls shall be protected by fire assemblies having a one hour fire protection rating (CFC 3206.3.2.).

2.1.5 **Rack Storage** -A combination of vertical, horizontal, and diagonal members that support stored materials. Racks can be fixed or portable.

2.1.5.1 Rack storage shall be in accordance with CFC 3206 and 3208. Racks with solid shelving having an area greater than 32 square feet measured between approved flue spaces at all four edges of the shelf shall be in accordance with CFC 3208.2.2.

2.1.6 **Solid Piled And Shelf Storage -** Shelf storage, storage in solid piles, solid piles on pallets, and storage in bin boxes not exceeding five feet in any dimension shall be in accordance with CFC 3206 and 3207.

2.1.6.1 **Solid Shelving** -Shelving that is solid, slatted, mesh, or grated located within racks that obstructs sprinkler water penetration through the racks**.**

2.1.6.2 **Shelf Storage** - Shelf storage greater than 12 feet but less than 15 feet in height shall be in accordance with the fire protection requirements set forth in NFPA 13. Shelf storage 15 feet or more in height shall be protected in an *approved* manner with special fire protection, such as in-rack sprinklers.

3.0 PERMIT:

3.1 **Rack Systems** -A Building permit is required to be issued by the City of San Jose Building Division for all racks over 5'-9" without regard to commodity classification.

3.2 **Fire Department:**

3.2.1 Plans for all HPCS shall be submitted to SJFD for review.

3.2.2 A separate fire permit may be required for new or modifications of the Hazardous Materials Inventory Statements (HMIS). Contact the SJFD Hazardous Materials Program Division at City Hall to discuss the Building Occupancy Classification Inventory in conjunction with the Hazardous Materials Management Plans for the project.

3.2.3 Fire System Permit(s) will be required for any new installation or modifications of an existing HPCS area requiring fire suppression/detection system.

3.2.3.1 Fire protection features for high-piled storage areas shall be in accordance with CFC Chapter 32 and other nationally recognized standards approved by the SJFD. Fire detection systems, smoke and heat removal, curtain boards, and fire sprinkler design densities shall extend to 15 feet beyond the high-piled storage area or to a permanent partition, whichever is least.

3.2.3.2 The aggregate of all high-piled storage areas within a building shall be used to design the fire protection features found in CFC Table 3206.2 (attached), unless such areas are separated from each other by a one hour fire barrier wall constructed in accordance with CBC 706.

3.2.3.3 Distinct occupancy groups shall be separated according to CBC 508.

3.2.4 A separate fire permit will be required for installation or modifications of the fire sprinkler system.

3.2.4.1 **Fire Sprinkler Systems -** When fire sprinklers are required by CFC Table 3206.2 or the CBC (or if otherwise provided), the sprinkler system shall be installed in accordance with 2013 NFPA 13. If this permit is in association with other Fire Sprinkler work, a common permit for all work shall be required portraying all work in effect.

3.2.4.2 **Small Hose Connections** – Small hose connections shall be provided in accordance with 2013 NFPA 13 8.17.5 for first-aid firefighting and over-haul operations.

3.2.4.3 Submittals shall comply with the criteria set forth in the SJFD handout "**Fire Sprinkler Systems Design, Installation, & Plan Submittal Requirements**".

3.2.5 A separate fire permit will be required for installation or modifications of the fire alarm system.

3.2.5.1 **Fire Detection Systems -** When fire detection is required by CFC Table 3206.2 or otherwise required by the CBC/CFC , an approved automatic fire detection system shall be installed in accordance with 2013 NFPA 72 standard throughout the high-piled storage area or extended to the HPCS, as pertains. This system shall be installed and monitored as required by CFC 907.

3.2.5.2 Submittals shall comply with the criteria set forth in the SJFD handouts "**Fire Alarm Systems Permit Application, Plan Submittal, Design, Installation, and Inspection Requirements**" or "**Dedicated Function Fire Alarm System Permit Application, Plan Submittal, Design, Installation, and Inspection Requirements**".

3.3 **Application -**At the time of permit application, the plans and specifications, including but not limited to the information listed below, shall be submitted for review and approval. For certain HPCS reviews, the services of a design professional familiar with the requirements contained in CFC Chapter 32 may be of great assistance. A minimum of three sets of plans shall be submitted with the following information per CFC 2301.3:

3.3.1 A letter of intent containing a detailed description of the products to be stored and the description of all containers, pallets, and packaging materials. This letter must also include a detailed description of the storage methods (racks, shelves, pallets, etc.), the total storage area in square feet, maximum storage height, and aisle widths. An authorized officer of the company or business must sign this letter. The letter shall be copied onto the plans.

3.3.2 A scaled site plan that shows the entire building, including all fire access lanes, fire hydrants, fire department connection, and fire sprinkler risers.

3.3.3 A scaled floor plan of the building showing locations and dimensions of the HPCS area, location of the racks, and access doors to the storage area.

3.3.4 The maximum desired/proposed storage height for each designated storage area per array. This height is measured from the finished floor to the highest point of the commodity stored (not shelve level).

3.3.5 The number of tiers within each rack.

3.3.6 The commodity clearance between the top of storage and the sprinkler deflector for each storage arrangement.

3.3.7 Aisle dimensions between each storage array. Aisles are measured from the actual edge of the commodity to commodity, not rack to rack.

3.3.8 Maximum pile volume for each storage array.

3.3.9 The location and classification of different commodity classes.

3.3.10 The location of commodities that is banded or encapsulated.

3.3.11 The dimension and location of the transverse and longitudinal flue spaces.

3.3.12 The sprinkler design requirements based on commodity type, aisle width, and sprinkler temperature rating as outlined in 2013 NFPA 13, Chapters 12 through 21 (e.g., .45/3000 with 286 degree heads). **A complete sprinkler design shall be submitted.**

3.3.13 The location of all steel columns in relationship to the racks. All steel columns located within a rack flue space or immediately adjacent to a rack in an aisle will require protection. See 2013 NFPA 13, Sections 16.1.4. and 17.1.4.

3.3.14 **Smoke and Heat Removal -** When smoke and heat removal are required by CFC Table 3206.2, smoke and heat vents shall be of an approved type and shall operate automatically by a heat response device rated between 100ºF and 200ºF above ambient temperatures and contain a manual release roof handle. Vent size shall be in accordance with CFC Table Section 910 (attached). The fusible link temperature is required to be at least one temperature rating greater than that of the fire sprinkler head at the roof to prevent early venting.

3.3.14.1 **Note** -Smoke and heat vents are *not* required when storage areas are protected by early suppression fast response (ESFR) sprinkler systems installed in accordance with 2013 NFPA 13.

3.3.14.2 **Smoke Vents** -The location, make, model, type, and automatic link temperature of the automatic/manual release smoke vents. Fusible links shall be at least one temperature rating higher than the fire sprinklers. Also see item 4.4 below. ***Note:*** *New construction shall only use approved/labeled smoke vents as specified by CFC 3206.7.*

3.3.14.3 **Smoke Vents in Existing Buildings -**Required smoke vents in existing structures (constructed under the 1998 or previous codes) shall be inspected for proper operation (manual & automatic) and proper link temperature by an independent qualified contractor.

3.3.14.3.1 Non required existing vents shall be either treated as a required vent or shall have the automatic and manual mechanism deactivated including the removal of the release handles.

3.3.14.3.2 An inspection report by the inspecting contractor shall be provided to SJFD prior to plan approval. The report at a minimum shall identify the year the building was constructed, a listing of all vents inspected, the fusible link temperature rating, the presence of a manual release mechanism, and the operational status of each vent. Prior to submitting the report to SJFD, all identified deficiencies must be corrected and included within the report.

3.3.14.3.3 If the smoke vents do not contain manual release devices, and SJFD determines that the manual release devices were not specifically required at the time of construction or during any previously approved high piled storage use, then manual release devices will not be required.

3.3.14.3.4 SJFD staff will evaluate all other conditions on a case by case basis during the review process. If this requirement is placed, SJFD staff will indicate the requirement adjacent to the SJFD approval stamp on the final approved plans from the proposed operation. The vent inspection report shall be copied onto the plans prior to SJFD plan approval.

3.3.15 **Curtain Boards -** When required by CFC Table 3206.2, curtain boards shall be installed in accordance with CFC 910.3.5. Demonstrate the design (construction), location, and depth of the curtain board assembly.

3.3.16 **Rack Flue Spaces -** Requirements for flue spaces within the rack storage are provided in CFC Table 3208.3 (attached). Double row racks shall be equipped with a pallet/commodity stop along the longitudinal flue space at each level. The stop shall be steel or other ferrous material, minimum ¼" thick, and in the mounted position shall extend a minimum of 4 inches above the shelve or cross member, or other method approved by the fire code official (CFC 3208.3).

3.3.17 **Automated Storage -** Automated storage including carousel storage shall be shown in accordance with CFC 3209.

3.3.18 **Specialty Storage -** Record storage facilities used for rack or shelf storage of combustible paper records greater than 12 feet in height shall be shown in accordance with CFC 3206 3208, and NFPA 13 and NFPA 232. Palletized storage of records shall be shown in accordance with CFC 3207.

3.3.19 **Fire Department Access -** When building access is required by CFC Table 3206.2, the plans shall indicate that access roadways are within 150 feet of all portions of the exterior walls of the building used for high-piled storage. When access doors are required by CFC Table 3206.2, the plans shall indicate that they are provided in each 100 lineal feet of exterior wall and face the required access roadway.

3.3.20 **Control of Ignition Sources -** The plans shall indicate that smoking shall be prohibited in the warehouse storage area. "NO SMOKING" signs shall be conspicuously posted. Clearance between ignition sources and the combustible storage shall be maintained in accordance with CFC 305 and 310.

4.0 INSPECTIONS:

4.1 Inspection appointments can only be made by the permit applicant or listed contractor.

4.2 In addition to the inspections required per the documents referenced by Items 3.2.4 and 3.2.5 above, the following are required:

4.2.1 **Maintenance Contract -**All fire and life safety equipment and systems required by the CFC shall be maintained operable at all times. Equipment, devices, and systems shall be regularly tested in accordance with nationally recognized standards, manufacturers' recommendations, and adopted regulations. A copy of the executed maintenance contract(s) for the fire/life safety systems and components associated with the building shall be provided with the close out documentation for the fire departments file.

4.2.2 **Annual Operational Permit -** An annual operational permit is required when a building or portion thereof is used for high-piled storage exceeding 500 square feet in area (see the definition of high-piled storage area under "Scope"). Annual operational permit fees are invoiced annually with the business license. CFC 3201.2.

5.0 DOCUMENT REVISIONS:

5.1 This document is subject to revisions. For general information and to verify that you have the most current document, please call (408) 535-7750, and request the current version date.

TABLE 910.3 REQUIREMENTS FOR DRAFT CURTAINS AND SMOKE AND HEAT VENTS [a]

OCCUPANCY GROUP AND COMMODITY CLASSIFICATION	DESIGNATED STORAGE HEIGHT (feet)	MINIMUM DRAFT CURTAIN DEPTH (feet)	MAXIMUM AREA FORMED BY DRAFT CURTAINS (square feet)	VENT-AREA-TO FLOOR-AREA RATIO [c]	MAXIMUM SPACING OF VENT CENTERS (feet)	MAXIMUM DISTANCETO VENTS FROM WALL OR DRAFT CURTAINS [b]
Group F-1 and S-1	—	0.2xH[d] but ≥ 4	50,000	1:100	120	60
High-piled storage (see Section 910.2.2)	≤ 20	6	10,000	1:100	100	60
I-IV (Option 1)	>20 ≤ 40	6	8,000	1:75	100	55
High-piled storage (see Section 910.2.2)	≤ 20	4	3,000	1:75	100	55
I-IV (Option 2)	>20 ≤ 40	4	3,000	1:50	100	50
High-piled storage (see Section 910.2.2)	≤ 20	6	6,000	1:50	100	50
High-hazard (Option 1)	>20 ≤ 30	6	6,000	1:40	90	45
High-piled storage (see Section 910.2.2)	≤ 20	4	4,000	1:50	100	50
High-hazard (Option 2)	>20 ≤ 30	4	2,000	1:30	75	40

a. Requirements for rack storage heights in excess of those indicated shall be in accordance with Chapter 32. For solid-piled storage heights in excess of those indicated, an approved engineered design shall be used.
b. The distance specified is the maximum distance from any vent in a particular draft curtained area to walls or draft curtains which form the perimeter of the draft curtained area.
c. Where draft curtains are not required, the vent area to floor area ratio shall be calculated based on a minimum draft curtain depth of 6 feet (Option 1).
d. "H" is the height of the vent, in feet, above the floor.

Table 3208.3: REQUIRED FLUE SPACES FOR RACK STORAGE

Rack Pattern	Fire Sprinkler Protection		Sprinklers at the Ceiling With or Without Minimum In-Rack Sprinklers			In-Rack Sprinklers at Every Tier	Non-Sprinklered
			≤ 25 feet		> 25 feet	Any Height	Any Height
Single-row rack	Transverse flue space	Size [b]	3 inches	NA	3 inches	NR	NR
		Vertically aligned	NR	NA	Yes	NA	NR
	Longitudinal flue space		NR	NA	NR	NR	NR
Double-row rack	Transverse flue space	Size [b]	6 inches [a]	3 inch	3 inches	NR	NR
		Vertically aligned	NR	NR	Yes	NA	NR
	Longitudinal flue space		NR	6 inch	6 inches	NR	NR
Multi-row rack	Transverse flue space	Size [b]	6 inches	NA	6 inches	NR	NR
		Vertically aligned	NR	NA	Yes	NA	NR
	Longitudinal flue space		NR	NA	NR	NR	NR

NA = Not Applicable, NR = Not Required
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.

TABLE 3206.2: GENERAL FIRE-PROTECTION AND LIFE SAFETY REQUIREMENTS

Commodity Class	**Size of High-Piled Storage Area** [a] (square feet)(See Sections 3206.2 and 3206.4)	**ALL STORAGE AREAS** (See Sections 3206, 3207 and 3208) [b]					**SOLID-PILED STORAGE, SHELF STORAGE AND PALLETIZED STORAGE** (See Section 3207.3)		
		Automatic Fire-Extinguishing (See Section 3206.4)	Fire-Detection System (See Section 3206.5)	Building Access (See Section 3206.6)	Smoke and Heat Removal (See Section 3206.7)	Draft Curtains (See Section 3206.7)	Maximum Pile Dimension [c] (feet)	Maximum Permissible storage height [d] (feet)	Maximum pile volume (cubic feet)
	0-500	Not Required [a]	Not Required	Not Required [e]	Not Required	Not Required	Not Required	Not Required	Not Required
	501-2,500	Not Required [a]	Yes [i]	Not Required [e]	Not Required	Not Required	100	40	100,000
	2,501-12,000 Public Accessible	Yes	Not Required	Not Required [e]	Not Required	Not Required	100	40	400,000
I-IV	2,501-12,000 Nonpublic Accessible (Option 1)	Yes	Not Required	Not Required [e]	Not Required	Not Required	100	40	400,000
	2,501-12,000 Nonpublic Accessible (Option 2)	Not Required [a]	Yes	Yes	Yes [j]	Yes [j]	100	30 [f]	200,000
	12,001 20,000	Yes	Not Required	Yes	Yes [j]	Not Required	100	40	400,000
	20,001 – 500,000	Yes	Not Required	Yes	Yes [j]	Not Required	100	40	400,000
	500,000 [g]	Yes	Not Required	Yes	Yes [j]	Not Required	100	40	400,000
	0-500	Not Required [a]	Not Required	Not Required [e]	Not Required	Not Required	50	Not Required	Not Required
	501-2,500 Public Accessible	Yes	Not Required	Not Required [e]	Not Required	Not Required	50	30	75,000
High-hazard	501-2,500 Nonpublic Accessible (Option 1)	Yes	Not Required	Not Required [e]	Not Required	Not Required	50	30	75,000
	501-2,500 Nonpublic Accessible (Option 2)	Not Required [a]	Yes	Yes	Yes [j]	Yes [j]	50	20	50,000
	2,501300,000	Yes	Not Required	Yes	Yes [j]	Not Required	50	30	75,000
	300,001-500,000 [g,h]	Yes	Not Required	Yes	Yes [j]	Not Required	50	30	75,000

a. When automatic sprinklers are required for reasons other than those in Chapter 32, the portion of the sprinkler system protecting the high-piles storage area shall be designed and installed in accordance with section 3207 and 3208.
b. For aisles, see Section 3206.9.
c. piles shall be separated by aisles complying with section 3206.9.
d. Fore 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. Se also Chapter 51 and 57 for special limitations for aerosols and flammable and combustible liquids, respectively.
e. Section 503 shall apply for all 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 officials.
h. High-piled storage areas shall not exceed 500,000 square feet. A 2-hour fire wall constructed in accordance with the *California Building Code* shall be used to divide high-piled storage 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 Section 3207 and 3208.
j. Not required when storage areas are protected by early suppression fast response (ESFR) sprinkler systems installed in accordance with NFPA 13.