SAN BERNARDINO COUNTY FIRE PROTECTION DISTRICT
COMMUNITY SAFETY DIVISION

620 South 'E' Street
San Bernardino, CA 92415-0179
(909) 386-8400

Standard Number

S - 1

Revision Date:
July 1, 2023

FIRE PREVENTION STANDARD

HIGH PILE STORAGE/WAREHOUSE BUILDINGS

AUTHORITY

Sections 102.9, 103 and 104.1 of the 2022 California Fire Code (CFC) and Sections 4 and 8 of Ordinance FPD 23-01 of the San Bernardino County Fire Protection District Fire Code (Fire Code) state that the Fire Code Official of the San Bernardino County Fire Protection District (SBCFPD) shall have the authority to adopt policies, procedures, rules and regulations in order to clarify the application for the Fire Code and to determine requirements not specifically provided for by the Fire Code. For further requirements on this subject, see section 508 of the 2022 California Fire Code. This standard may be modified with the approval of the Fire Code Official.

PURPOSE

The purpose of this standard is to provide the requirements for the protection of high-piled combustible storage (HPS) for a variety of commodities. HPS increases the potential fire hazard within a structure by increasing the vertical height of storage and by providing stability of storage (e.g., rack and automated storage) in a fire situation. The following requirements will ensure that appropriate measures have been taken to provide safety to the public and that the required protection of these commodities has been designed for the appropriate level of hazard as required by the currently adopted California Fire Code (CFC), Chapter 32. The California Building Code, NFPA 13, San Bernardino County Fire Protection District Standards and any other nationally applicable standards, shall still apply.

SCOPE

This standard shall apply to all storage occupancies designated as High Pile Storage as defined by the currently adopted California Fire Code (CFC) Chapter 32, the San Bernardino County Fire Protection District Code, Standards, and any other nationally applicable standards.

DISCLAIMER

These standards may change without notice. Whenever applicable statutes, regulations and Standards are updated and adopted, the latest shall apply. Please contact the Community Safety Division at (909) 386-8400 to determine if these Standards have changed. These requirements do not exempt any individual from complying with other applicable state, county, or city codes and Standards.

SUBMITTALS

1) The applicant shall submit the plans and all required documentation online through the San Bernardino County EZOP website, https://wp.sbcounty.gov/ezop

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NOTE: If the project is in the City of Fontana please contact (909) 428-8890 for submittal information.

2) All pages of plans shall have a three-inch (3) by three-inch (3) box labeled "FOR FIRE DEPARTMENT USE ONLY" located in the bottom right corner of ever page for approval stamp.

3) "HIGH PILE COMBUSTIBLE STOCK QUESTIONNAIRE" **See attachment S-1.1**.

4) The following shall be submitted to the Fire Protection District for approval and permit prior to performing work on any high pile storage system.

   a) A letter of intent shall be copied on the plans that contains 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, floor storage), 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.

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

   c) A scaled floor plan of the building showing locations and dimensions of the high pile storage area, locations of racks, and access doors to the storage area.

   d) The maximum desired/proposed 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 shelf level.

   e) Number of tiers within each rack.

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

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

   h) Maximum pile volume for each storage array.

   i) The location and classifications of different commodity classes.

   j) The location of commodities that are banded or encapsulated.

   k) The dimensions and location of the transvers and longitudinal flue spaces.

   l) Idle pallet storage location(s).

m) The sprinkler design requirements based on commodity type, aisle width, and sprinkler temperature rating as outlined in NFPA 13, Chapter 12-18. A complete sprinkler design shall be submitted under a separate permit by a C16 licensed sprinkler contractor.

n) The location, make, model, type, listing and automatic link temperature of any automatic/manual release smoke/heat vents.

o) If the building is equipped with mechanical smoke exhaust, the plans shall show location, size, operation, supply air, interlocks, wiring and control.

p) Fire control room location.

q) Pallet/commodity stop details for maintaining the required flue space.

DEFINITIONS

COMMODITY ANALYSIS: A questionnaire, which is required to be answered pertaining to the identity and description of stored materials. This standardized format will provide vital information to help determine the required fire protection needed for warehouse business. This information shall be filed, as a record of the business, and as part of the application permit. **(See Attachment S-1.1)**

FIRE CONTROL ROOM: A central control station room for fire department operations housing the fire alarm control panel, fire protection systems site map, mechanical exhaust controls, etc.

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 in height and storage on racks of high-hazard commodities which exceed 30 feet in height.

ENCAPSULATED STORAGE: Encapsulated commodities are products wrapped on six sides with plastic. Sprinkler water is not able to penetrate into the commodity if it is encapsulated. Typically, encapsulated products require a higher level of fire sprinkler protection.

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 6 feet in height.

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HIGH-PILED STORAGE AREA: An area within a building which is designated, intended, proposed, or actually used for high-piled combustible storage, including any required aisle widths.

NON-ENCAPSULATED STORAGE: Non-encapsulated commodities are products which may be wrapped on four or five sides, with the top remaining open to permit fire sprinkler water to penetrate within the pile.

OPEN RACK: Racks without shelving or with shelving in racks that are fixed in place with shelves having a solid surface and shelf area equal or less than 20 sq ft or with shelves having a wire mesh, slatted surface, or other material with openings representing at least 50 percent of the shelf area including the horizontal area of the rack members and where the flue spaces are maintained.

PALLET/COMMODITY STOPS: A method of restricting the positioning of pallets on a rack so as to not obstruct the required longitudinal flue space.

RACK STORAGE: A combination of vertical, horizontal, and diagonal members that support stored materials. Racks can be fixed or portable.

SHELF STORAGE: Storage on shelves less than 30 inches deep with the distance between shelves not exceeding three feet vertically. For larger shelves and other storage arrangements see Rack Storage.

SOLID SHELVING: Shelving that is fixed in place, slatted, wire mesh, or other type of shelves located within racks. The area of a solid shelf is defined by perimeter aisle or flue space on all four sides or by the placement of loads that block openings that would otherwise serve as the required flue spaces. Solid shelves having an area equal to or less than 20 ft² are defined as open racks. Shelves of wire mesh, slats, or other materials more than 50 percent open and where the flue spaces are maintained are defined as open racks. 2022 NFPA 13 Section 3.3.209

GENERAL

1) Fire-protection and life safety features for high pile storage areas shall be in accordance with the currently adopted California Fire Code Chapter 32, NFPA 13 and other nationally recognized standards.
2) A construction permit is required when a building or portion thereof is used for high pile storage that exceeds 500 square feet in area. All permits will be issued following plan approval and completion of corresponding inspections of the high pile storage installation. Approved plans shall remain onsite for the life of the high pile storage system(s).

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3) Operational permits for high pile storage shall be renewed annually, or upon a change in commodity or configuration. A previously approved high pile plan may be used for renewing permits, unless changes in the storage configuration and/or commodity result in the need for a new plan review, update and/or approval.

4) Previously approved high pile storage system plans are not transferable to new tenants or sub leases.

5) The designation of a high piled storage area, or portion thereof intended for storage of a different commodity class, shall be based on the highest hazard commodity class stored, unless an engineering analysis has been submitted for review and approval.

6) In buildings with multi-tenant spaces, the plan shall show if the tenant spaces within the building are separated by a one-hour fire barrier, or that the adjacent tenant(s) does not have high pile storage. In the event that the adjacent tenant(s) has high pile storage and are not separated by a one-hour fire barrier per CBC Section 707, the aggregate of all areas of high pile storage within the building shall be used for the application of Table 3206.2. Additionally, the provisions of CFC 3206.3.2.1 for multiclass high-piled storage areas shall apply.

7) A permanent, visual method of indicating the maximum allowable storage height and floor storage area shall be provided. **(See Diagram S-1.2)**

TECHNICAL ASSISTANCE

1) Due to the complex building design requirements specified within the California Fire Code and adopted standards, the Fire Code Official is authorized to require a technical report and plans with the stamp and signature of a professional engineer, and it is often necessary to obtain the service of a fire protection design professional to assist with developing a protection scheme that meets the requirements of both the California Building and Fire Codes.

2) A Fire Protection Engineer shall provide a technical report and stamp all pages of plan when storing High Hazard, Group "A" plastics, aerosols, or similar commodities.

FIRE CONTROL ROOM

1) A fire control room for fire department operations shall be provided when the building is more than fifty thousand ($50{,}000^2$) square feet or greater. The fire control room shall be separated from the remainder of the building by not less than a two-hour fire-resistive occupancy separation.

2) The fire control room shall be a minimum of ninety-six (96^2) square feet with a minimum dimension of eight (8) feet and shall be accessible from the exterior of the building.

3) Fire Control rooms shall contain the following as a minimum:

   a) The fire alarm control panel.

b) Status indicators and controls for mechanical smoke removal system.

c) Other fire-protection equipment and system controls as required by the Fire Code Official.

d) A 30" x 42" permanently affixed site map shall be installed in the fire control room. Site map shall show locations of all sprinkler risers, fire suppression water valves, mechanical smoke removal systems, roll down fire doors, means of egress, etc.

e) Provide signage on the door stating, "FIRE CONTROL ROOM". Letters shall be a minimum four (4) inches height with a one (1) inch stroke, red on a white background.

f) A Knox lockbox for the building shall be located at the fire control room.

g) Lighting for the fire control room shall have emergency lighting powered by the standby electrical system.

SPRINKLER SYSTEMS

1) Fire sprinkler systems shall be designed in accordance with NFPA 13 and San Bernardino County Fire Protection District Standard F-1 to protect the commodity class of the materials being stored.

2) Where more than two sprinkler systems protect the high pile storage area, the components of the systems shall be individually identified to allow easy recognition of the system in question. Any method of identification approved by the Fire Code Official may be used (colored tapes, paint, numbers, letters, etc.). At a minimum, the following components shall be identified: risers, cross mains, branch line tails.

BUILDING ACCESS

1) Where building access is required by the fire code, fire apparatus access roads shall be provided to within one hundred-fifty (150) feet of all portions of the exterior walls of the building used for high piled storage.

   Exception: Where fire apparatus access roads cannot be installed because of topography, railways, waterways, non-negotiable grades or other similar conditions, the Fire Code Official is authorized to require additional fire protection.

2) Where access doors are required, fire department access doors shall be provided in each one hundred twenty-five (125') lineal feet, or fraction thereof, of the exterior walls which face the required fire apparatus access roads. Access doors shall not be less than three (3) feet in width and six (6) feet eight (8) inches in height. Roll-up doors shall not be used unless approved by the Fire Code Official.

3) Access doors shall be numbered with a minimum of three (3) inch number on contrasting background, located in the top half of the door. Numbers shall be placed on the interior and exterior of doors.

4) Where fire department hose connections are required in the building, the doors that provides access to these connections shall have a blue reflector (hydrant marker) attached to the wall to identify the access to the hose connection (see Standard W-2 for specifications of the hydrant markers).

FLUE SPACES

1) Flue spaces shall be provided in accordance with Table 3208.3. Required flue spaces shall be maintained mechanically and approved by SBCFPD. **(See Diagram S-1.3)**

2) Double-row racks shall be equipped with a pallet/commodity stop along the longitudinal flue space at each level. The stop along the longitudinal flue space shall be steel or other ferrous material ¼" thick and, in the mounted position, shall extend a minimum of four (4) inches above the shelf or cross member approved by the fire code official. **(See Diagram S-1.4)**

3) In double row racks, where products are hand-stacked, chain link shall be securely attached to the rear of both racks. The chain link shall be a minimum of 12 gauge. Attachment method shall be as approved by the fire code official. **(See Diagram S-1.5)**

   NOTE: Regardless of the design of the pallet stop, the longitudinal flue space shall be measured from the back of the pallet stop to the back of the opposing pallet stop. Transverse flue space is measured as the distance between the loads, not the distance between the racks. A flue space's net width is a measure of its gross width minus any horizontal obstructions, such as rack uprights, located within the flue space.

MECHANICAL SMOKE REMOVAL

1) Mechanical smoke removal systems shall be provided for buildings protected by ESFR sprinkler systems as required by the Fire Code Official.

2) The mechanical smoke removal systems shall meet the requirements of the currently adopted California Fire Code and the following:

   a) Override controls for the smoke exhaust system shall be located in the fire control room. Controls shall allow fire personnel to turn each fan on or off individually, with operational status indicators.

   b) Maximum spacing for fans: within 150' of perimeter walls, no greater than 250' between fans.

   c) Fans are to be evenly spaced throughout the roof area.

   d) Smoke exhaust fans shall be labeled and easily visible from ground level.

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SMOKE AND HEAT VENTS

1) 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 per NFPA 204. An inspection report shall be provided to SBCFPD as part plan submittal, all deficiencies shall be noted and corrected. The Inspection report shall be copied onto the plans and contain the following:
   a) Identify the year the building was constructed.
   b) Roof plan showing the location of each vent inspected.
   c) The fusible link temperature rating.
   d) The presence of a manual release mechanism.
   e) Operational status of each vent.
2) In sprinklered buildings, the fusible links for smoke and heat vents shall operate at a temperature no less than three hundred sixty (360) degrees or one hundred (100) degrees above the fire sprinkler rating, whichever is greater.

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DIAGRAM S-1.2 STORAGE MARKINGS

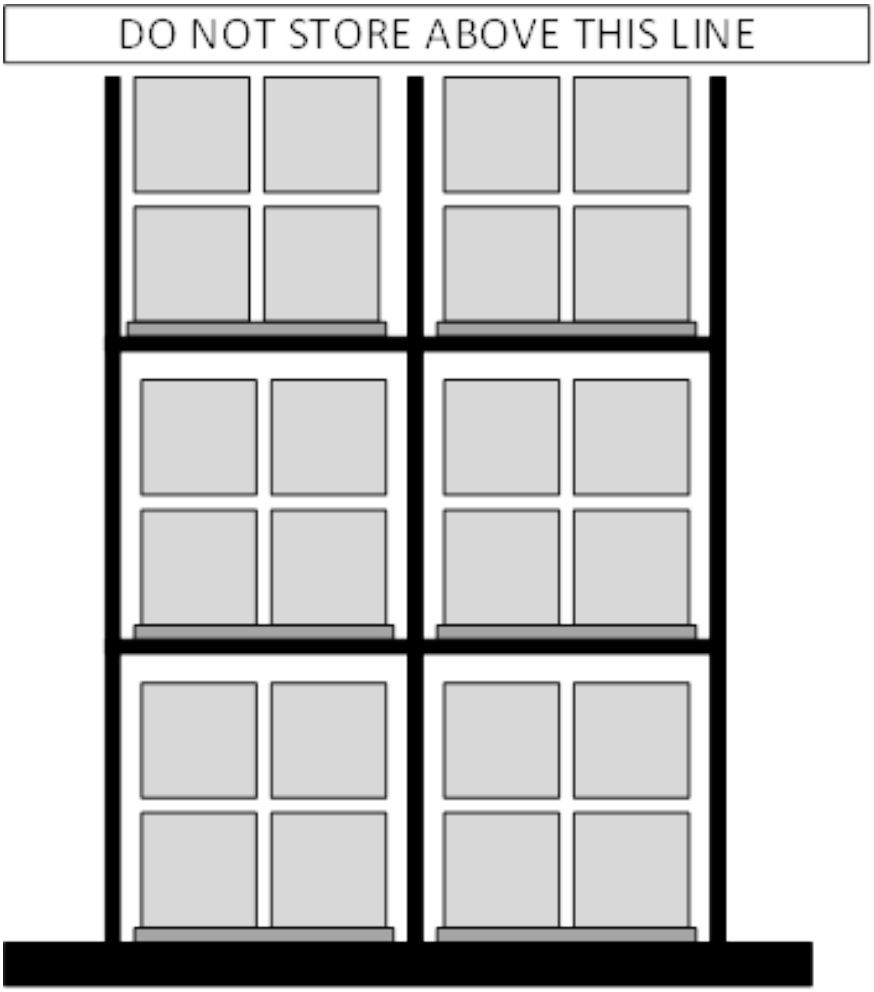

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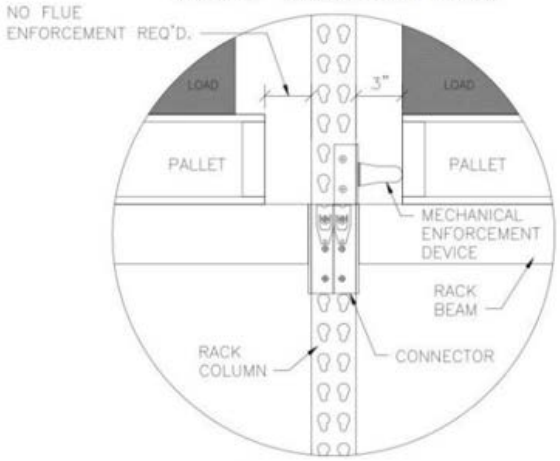
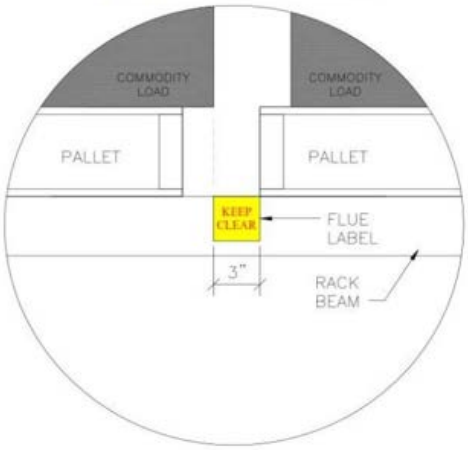
DIAGRAM S-1.3 TRANSVERSE FLUE

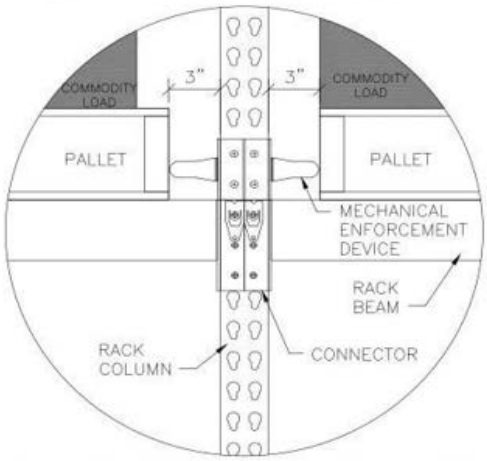
MECHANICAL ENFORCEMENT DEVICE AT RACK COLUMN
(NET 3" TRANSVERSE FLUE)



3" TRANSVERSE FLUE LABEL
BETWEEN PALLET LOADS



MECHANICAL ENFORCEMENT DEVICE AT RACK COLUMN
(NET 6" TRANSVERSE FLUE)



6" TRANSVERSE FLUE LABEL
BETWEEN PALLET LOADS

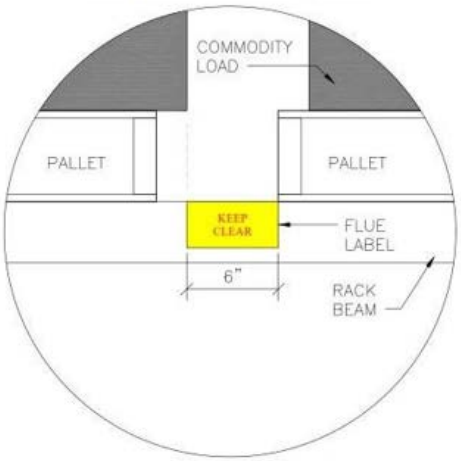


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DIAGRAM S-1.4 PALLET/COMMODITY STOP

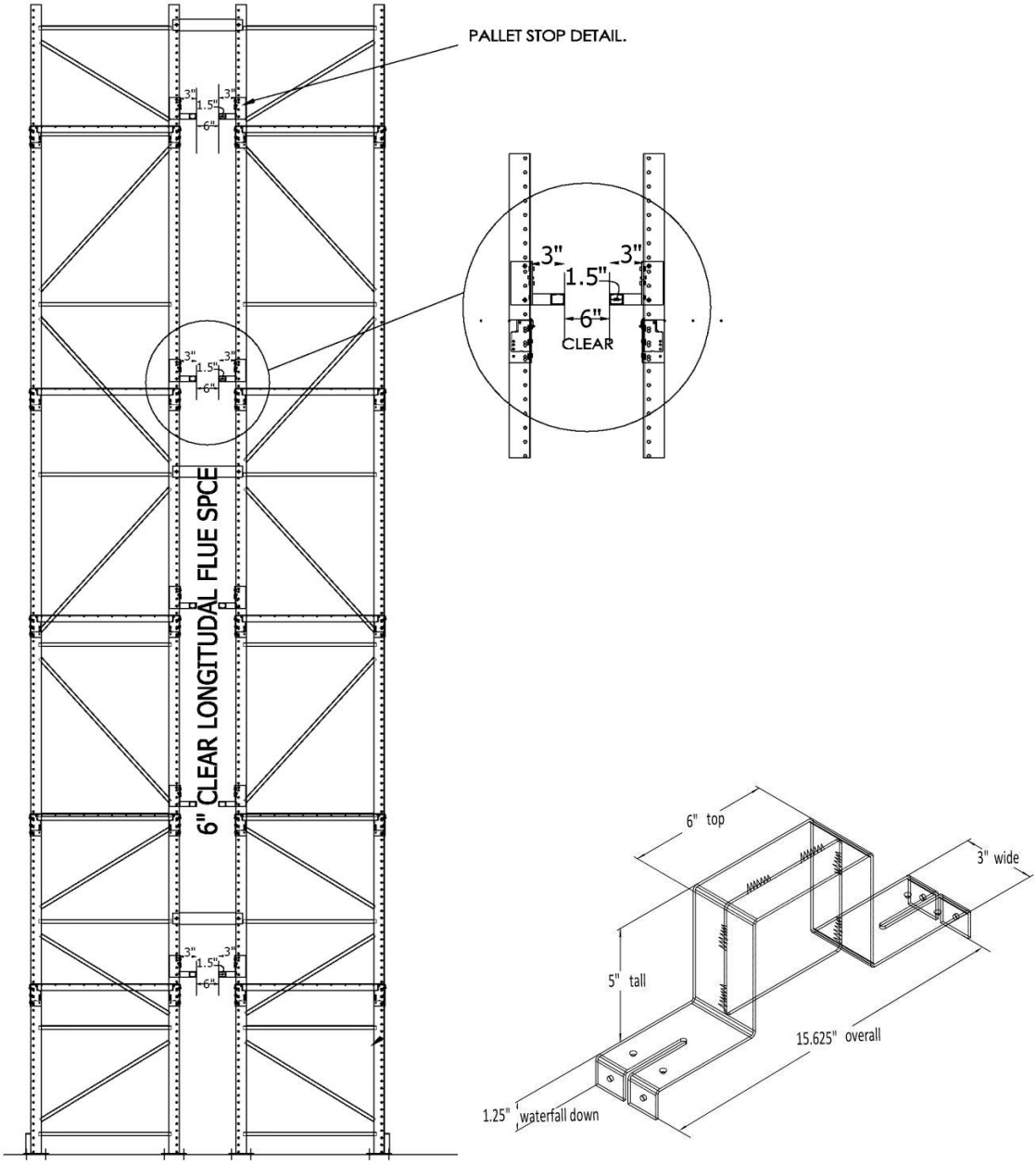

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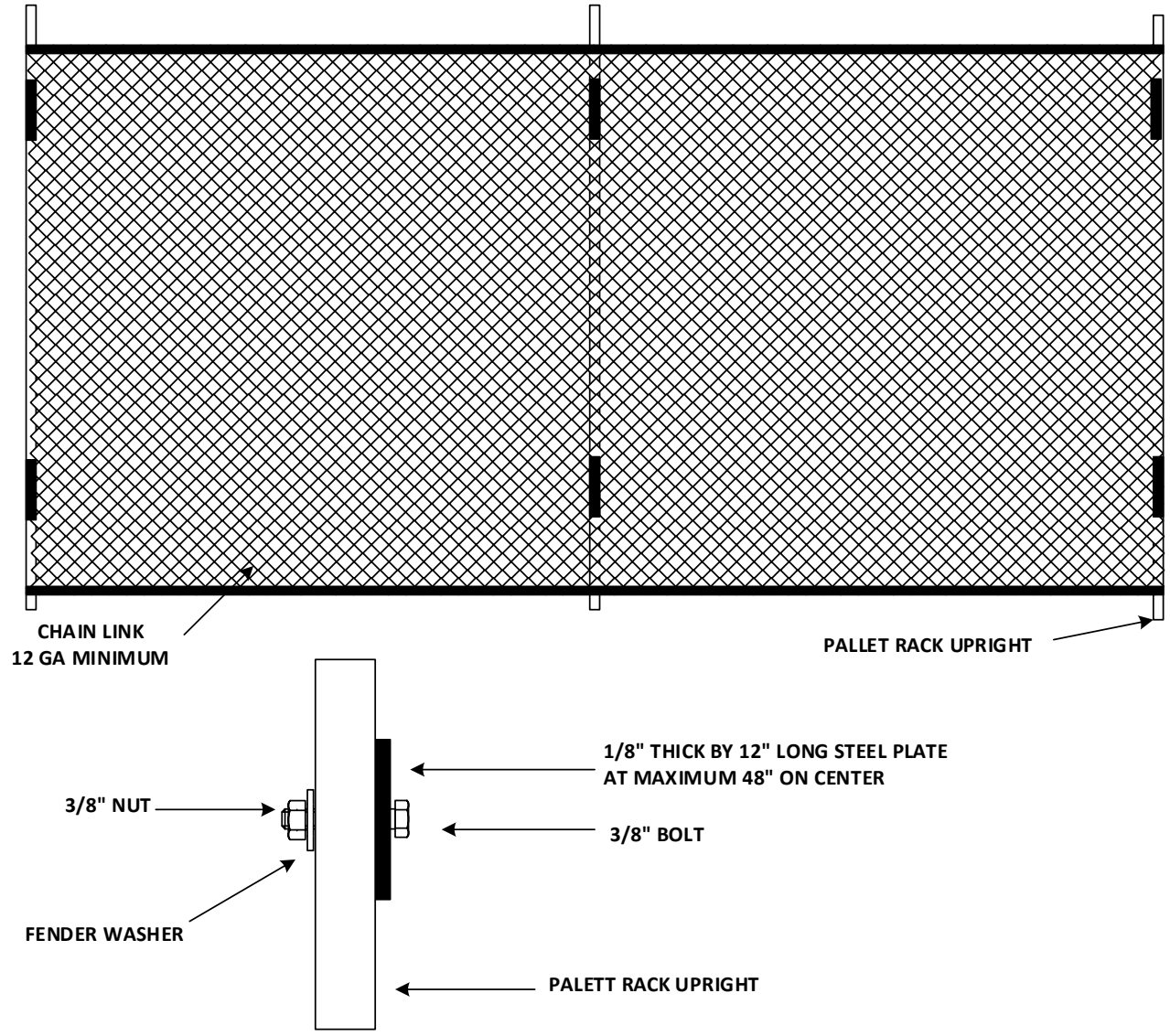
DIAGRAM S-1.5 CHAIN LINK DETAIL



SAN BERNARDINO COUNTY FIRE PROTECTION DISTRICT
COMMUNITY SAFETY SECTION

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HIGH PILE COMBUSTIBLE STOCK QUESTIONNAIRE

ATTACHMENT S-1.1

BUSINESS NAME: _____

BUSINESS ADDRESS: _____

The purpose of this questionnaire is to assist the Fire Prevention Office in determining the Fire Code requirements for the storage of High Piled Combustible Stock at your facility. The requirements will be based on the currently adopted editions of the California Fire Code, Chapter 32 and NFPA 13. The following information should be filled out and signed by a qualified person having the necessary code knowledge required for High Piled Combustible Stock, e.g., Code Consultant, Insurance Underwriter or Fire Protection Engineer.

1. Commodity Class: _____ (If commodity is Plastic, please fill out attachment "A")	Source:	❑ CFC	❑ NFPA

2. Description of storage:

3. Maximum height of storage (in feet):

4. Building height, lowest and highest point (in feet):

5. Method of storage is: (Check all that apply)

❑ Encapsulated in plastic*	❑ Non-encapsulated
❑ Wooden Pallets	❑ Plastic pallets
❑ On racks with solid shelves	❑ On rack without solid shelves
❑ Bin box**	❑ Solid pile

6. Types of racks:

❑ Single Row	❑ Double Row	❑ Multiple Row

7. Area of storage:

❑ 0 – 500 sq ft	❑ 12,000 – 20,000 sq ft
❑ 501 – 2,500 sq ft	❑ 20,001 – 300,000 sq ft
❑ 2,501 - 12,000 sq ft	❑ _____

*Method of packaging consisting of a plastic sheet enclosing the side and top of a pallet load.

**Five-sided box container with the open side facing an aisle.

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8. Idle pallet storage?	❑ Yes	❑ No		
9. Sprinkler information:				
a. Sprinkler density?				
b. Rack sprinklers?	❑ Yes	❑ No		
c. Temperature rating of sprinkler heads in:	Ceiling: °F	Racks °F		
10. Distance from top of storage to fire sprinkler deflector?	feet inches			
11. Flue space:	❑ Transverse inches	❑ Longitudinal inches		
12. Smoke vents?	❑ Yes	❑ No	Ratio : sq ft	
❑ Automatic	❑ Manual	❑ Automatic/Manual		
13. What is the temperature of operation?				
❑ Automatic	❑ Manual	❑ Automatic/Manual		
14. Aisle width between racks and storage:	feet inches			
Access aisle width(s):	feet inches			
15. Smoke detection system?	❑ Yes	❑ No		
Type:	❑ Photoelectric	❑ Ionization	❑ Beam	❑ Other
16. Maximum cubic feet per pile:				
❑ 50,000 cu ft	❑ 200,000 cu ft			
❑ 75,000 cu ft	❑ 400,000 cu ft			
❑ 100,000 cu ft				
17. Access roadways within 150-feet of all portions of exterior walls?	❑ Yes	❑ No		
18. Access door provided every 100 lineal feet on exterior walls, which face access roadways.	❑ Yes	❑ No		
19. Hose Stations:	❑ Yes	❑ No		
Hose Length:	❑ 50 ft	❑ 100 ft	❑ 150 ft	

Name: _____

Signature: _____

Title: _____ Date: _____

Phone: _____

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ATTACHMENT A **PLASTICS**			
1. Group type of plastic in storage? (See list below)	❑ A	❑ B	❑ C
2. Percentage of plastic in storage? _____ % (volume or weight)			
3. If group type is "**A**", check each item below that applies to your commodity.			
Is the plastic:	❑ Expanded	❑ Non-expanded	❑ Free Flowing Class IV
How is the plastic packaged? (NFPA 13, 2022 Edition)	❑ Exposed	❑ Cartoned	
How is the plastic piled? (NFPA 13, 2022 Edition)	❑ Stable	❑ Unstable	❑ Solid unit load

Group A	
ABS (Acrylonitrile-Butadiene-Styrene Copolymer)	Polycarbonate
Acrylic (Polymethyl Methacrylate	Polyester Elastomer
Acetyl (Polyformaldehyde)	Polyethylene
Butyl Rubber	Polypropylene
EPDM (Ethylene – Propylene Rubber)	Polystyrene
FRP (Fiberglass Reinforced Polyester)	Polyurethane
Natural Rubber (if expanded)	PVC (Polyvinyl Chloride – highly plasticized, e.g., Coated Fabric, unsupported film)
Nitrile Rubber (Acrylonitrile Butadiene Rubber)	San (Styrene Acrylonitrile)
PET (Thermoplastic Polyester)	SBR (Styrene-Butadiene Rubber)
Polybutadiene	

Group B	
Cellulosic (Cellulose Acetate, Cellulose Acetate Butyrate, Ethyl Cellulose)	Propylene Copolymer
Chloroprene Rubber	Natural Rubber (not expanded)
Fluoroplastics (ECTFE – Ethylene-Chlorotrifluoroethylene Copolymer; ETFE – Ethylene Tetrafluoroethylene Copolymer FEP – Fluorinated Ethylene	Nylon (Nylon 6, Nylon 6/6)
	Silicone Rubber

Group C	
Fluoroplastics (PCTFE-Polychlorotrifluoroethylene, PTFE-Polytetrafluorethylene)	PVDC (Polyvinylidene Chloride)
Melamine (Melamine Formaldehyde)	PVF (Polyvinyl Fluoride)
Phenol	PVDF (Polyvinylidene Fluoride)
PVC (Polyvinyl Chloride-rigid or lightly plasticized, e.g., pipe, pipe fittings)	Urea (Urea Formaldehyde)