



Travis County ESD No. 12

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HIGH PILED STORAGE PLAN REQUIREMENTS

The intent of this guideline is to provide the requirements for the protection of high-piled 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 provided instability of storage (i.e. rack and automated storage) in a fire situation. The following requirements are intended to ensure the minimum measures required by code have been taken to provide for the public safety and that the required protection of these commodities has been designed in accordance with Chapter 32 of the 2015 International Fire Code, the 2015 International Building Code, and locally adopted amendments enforced by Travis County ESD No. 12.

SCOPE

This guideline provides the minimum requirements for all HPS within the jurisdiction of Travis County ESD No. 12.

For the purposes of the guideline, certain terms are defined, per the International Fire Code Section (IFC) 202:

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 the 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 liquids, idle pallets and similar commodities, where the top of storage is greater that **6 feet** in height.

High-Piled Storage Area

An area within a building that is designated, intended, proposed, or used for high-piled combustible storage. Used for purposes of selecting the applicable fire protection requirement row in Table 3206.2:

- This area shall include the “footprint” of the actual storage array (racks, shelves, fixtures, or pallets), including all 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.
- Each storage area shall also include a 44-inch perimeter aisle calculated in the footprint. This additional perimeter is not required for areas that are against a wall.
- 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 the International Building Code. Openings in such walls shall be protected by fire assemblies having a one-hour fire protection rating.

Rack Storage

Any combination of vertical, horizontal, and diagonal members that support stored materials. Racks can be fixed or portable.

Shelf Storage

Storage on shelves up to and including 30 inches deep and separated by aisles at least 30 inches wide. The distance between the shelves shall not exceed three feet vertically. For larger shelves and other storage arrangements, see *Rack Storage*.

Solid Shelving

Shelving that is fixed in place and is solid, slatted, mesh, or grated within racks that obstructs sprinkler water penetration through the racks. Solid shelves that have an area equal to or less than 20 square feet and shelves of wire mesh, slates or other materials more than 50 percent open and where the flue spaces are maintained shall be defined as open racks.

SUBMITTAL REQUIREMENTS

At the time of permit application, a plan and specifications for all items related to the high-piled storage installation, including but not limited to the information listed below, shall be submitted to Travis County ESD No. 12 for review and subsequent approval.

FOR CERTAIN HPS REVIEWS, THE SERVICES OF A DESIGN PROFESSIONAL OR HIGH-PILED STORAGE CONSULTANT FAMILIAR WITH THE REQUIREMENTS FOUND IN CHAPTER 32 OF THE INTERNATIONAL FIRE CODE MAY BE OF GREAT ASSISTANCE TO THE APPLICANT AND IS STRONGLY RECOMMENDED.

1. General

A plan shall be submitted with the following information per the items listed in the International Fire Code, Section 3201.3, Items 1 through 12, and locally adopted requirements. Requirements for each required item is further defined below:

- A letter of intent containing a detailed description of the products to be stored and a thorough description of all containers, pallets, and packaging materials. The letter must also include a detailed description of:
 - a. Storage methods (racks, shelves, pallets)
 - b. Total storage area in square feet
 - c. Maximum storage height
 - d. Aisle widths

This letter of intent must be signed by an authorized representative of the company or business and must be copied onto the plans.

- A scaled site plan that shows the entire building, including all fire access lanes, fire hydrants, FDC, and fire sprinkler system risers.
- A scaled floor plan of the building showing locations and dimensions of the HPS area, location of the racks, and access doors to the storage area. Linear feet between access doors shall be provided on the plan.
- Maximum proposed usable storage height for each designated storage area per array. The height is measured from the finished floor to the highest point of the commodity stored, **not the level of the shelf.**
- The number of tiers within each rack.
- The commodity clearance between the top of storage and the sprinkler deflector for each storage arrangement.
- Aisle dimensions between each storage array. Aisles are measured from the actual edge of the commodity to commodity, not rack to rack.
- Maximum pile volume for each storage array.
- The location and classification of commodities in accordance with 2015 International Fire Code, Section 3203.
- The location of commodities that are banded or encapsulated.
- The dimension and location of transverse and longitudinal flue spaces.
- The sprinkler design requirements based on commodity type, aisle width, and sprinkler temperature rating as outlined in Chapter 12 of NFPA 13. A complete sprinkler design shall be submitted under a separate permit by a licensed sprinkler designer/company.
- The location of all steel columns in relationship to the racks. All steel columns located within a rack flue space or immediate adjacent to a rack in an aisle will require sprinkler protection, in accordance with 2013 NFPA, Section 16.1.4.
- The type, location, make, model, listing, and automatic link temperature of the manual mechanical smoke removal system.
In sprinklered buildings, the fusible links for smoke and heat vents shall operate at a temperature not less than 100 degrees and no more than 200 degrees above the sprinkler rating. In non-sprinklered buildings, the fusible links shall operate between 100 and 220 degrees above the ambient temperature.

Note: An inspection report shall be provided on required smoke vents in existing structures. The report shall include at a minimum, 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 inspection report to Travis County ESD No. 12, all identified deficiencies must be corrected and included within the report.

In a high-piled storage system is to be installed in an existing building, if the building owner can demonstrate that the smoke and heat vents have been maintained and inspected per NFPA 204, a new inspection report will not be required.

- If required, the type, design, location, and depth of the curtain board assembly, if applicable.
- The occupancy group as defined in Chapter 3 of the International Building Code.
- Pallet/commodity stop details for maintaining required flue spaces.

2. PERMITS

A plan and all specifications shall be submitted to Travis County ESD No. 12 and the City of Manor as applicable. A fire code permit is required when a building or portion thereof is used for high-piled storage exceeding 500 square feet in area.

3. COMMODITY CLASSIFICATION – IFC 3203

Commodities shall be classified as Class I, II, III, IV or High Hazard in accordance with IFC Chapter 32 and all referenced standards.

Plastics shall be classified as Group A, B, or C in accordance with IFC Chapter 32. Use IFC Figure 3203.7.4 to determine the proper commodity classification of a mixed commodity in a package carton, or on a pallet where plastics are involved. 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 to a high-hazard commodity.

The designation and protection features of a high-piled combustible storage area, or portion thereof intended for storage of different commodity classes, shall be based on the highest hazard commodity stored.

Note: Except as otherwise demonstrated by engineering analysis to be adequately protected by the *automatic sprinkler system* provided.

Note: Flammable liquids, flammable solids, flammable gases, aerosols, explosives, oxidizers, and reactive materials fall under the category of hazardous materials and have additional codes (and subsequent plan submittals) that apply.

4. GENERAL FIRE PROTECTION AND LIFE SAFETY FEATURES – IFC 3206

Fire protection and life safety features for high-piled storage areas shall be in accordance with Sections 3206.2 through 3206.10. Where required by Table 3206.2, fire detection systems, smoke and heat removal and automatic sprinkler design densities shall extend the lesser of 15 feet beyond the high-piled storage area or to a permanent partition, whichever is least.

The aggregate of all high-piled storage areas within a building shall be used to design the fire protection features found in IFC Table 3602.2, unless the areas are separated from each other by a one-hour fire barrier wall constructed in accordance with the standards set forth in the International Building Code. Distinctly different occupancy groups shall be separated according to the standards set forth in the International Building Code.

5. FIRE SPRINKLER SYSTEMS – IFC 3206.4

Where fire sprinklers are required by Table 3206.2, the International Building code, or if otherwise provided, the sprinkler system shall be installed in accordance with 2013 NFPA 13. The use of more current codes is permitted provided the requirements do not present a lesser level of protection. A full description of the tables and figures in NFPA 13, Section 12 (Storage) shall be used to determine the design criteria required.

6. FIRE DETECTION SYSTEMS – IFC 3206.5

Where fire detection is required by Table 3206.2, an approved automatic detection system shall be installed throughout the high-piled storage area. The system shall be monitored and be in accordance with Section 907.

7. FIRE DEPARTMENT ACCESS – IFC 3206.6

Where building access is required by Table 3602.2, fire apparatus access roads shall be provided within 150 feet of all portions of the exterior walls of buildings used for high-piled storage. If access doors are required, they shall be provided in each 100 lineal feet of exterior walls that face required fire apparatus access roads.

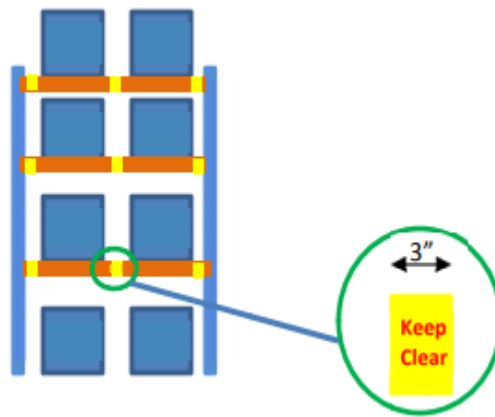
8. SMOKE AND HEAT REMOVAL – IFC 3206.7

Where smoke and heat removal is required by Table 3206.2, it shall be provided in accordance with IFC Section 910.

Smoke and heat vents are not required when storage areas are protected by ESFR sprinkler systems installed in accordance with NFPA 13.

9. RACK FLUE SPACES – IFC 3208.3

Flue spaces shall be provided in accordance with Table 3208.3. Single and double row racks shall be provided with a transverse flue space. Transverse flue spaces shall be kept clear. The load beams shall be painted with a 3” yellow strip with the words in red that read “Keep Clear,” as indicated below. Durable vinyl tape or other appropriate material may be used in lieu of paint or other methods as approved by Travis County ESD No. 12



Note: 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. In other words, a rack upright (typically 3-inches wide) is not considered a flue space due to the cross bracing used.



10. 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 IFC 3207.

11. RACK STORAGE

Rack storage in a non-sprinklered and sprinklered building shall be in accordance with IFC 3206 and 3208. The sprinkler protection for solid shelves shall be based on the NFPA 13 definition for solid shelves.

12. AUTOMATED STORAGE

Automated storage shall be in accordance with IFC 3209.

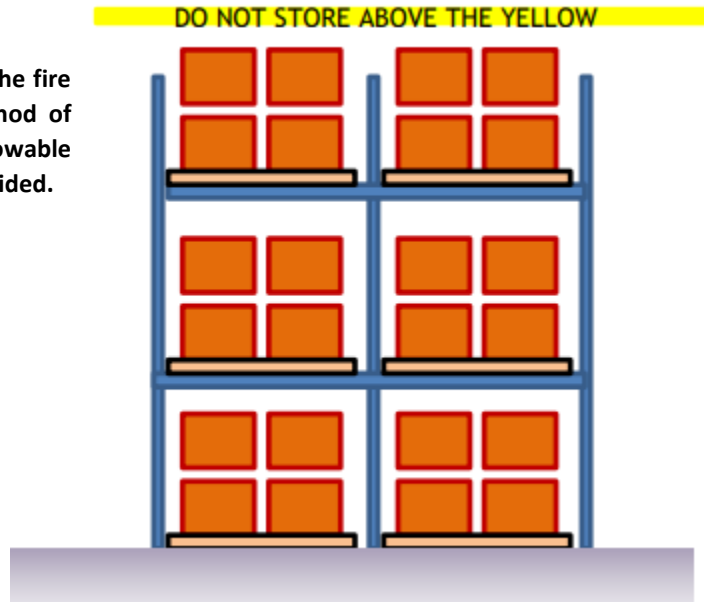
MAINTENANCE

All fire and life safety equipment required by the International Fire Code shall be maintained and operable at all times. The responsibility for inspections, maintenance of the high-piled storage area as it is approved, and all fire and life safety systems required

by the International Fire Code shall be the ultimate responsibility of the building owner unless the responsibility has been transferred in written form to another party via a legal document.

Note: Where required by the fire code official, a visual method of indicating the maximum allowable storage height shall be provided.

IFC 3205.6



APPROVED PLANS

A copy of the approved high-piled storage plans shall be signed by the Travis County ESD No. 12 inspector upon approval. Following the approval of the plans, a copy of the approved plans shall be maintained on the premises in an approved location for the life of the high-piled storage system.

Travis County ESD No. 12 shall be consulted prior to any changes affecting the approved or existing HPS system(s).

TECHNICAL ASSISTANCE

Due to the complexity of the designs specified within the International Fire Code and adopted standards, it may be necessary to obtain the service of a fire protection design professional or high piled storage consultant to assist with developing protection measures that meet or exceed the requirements of the International Fire Code and other applicable regulations and standards.

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 system (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)	Maximum pile dimension ^c (feet)	Maximum permissible storage height ^d (feet)	Maximum pile volume (cubic feet)
I-IV	0-500	Not Required ^a	Not Required	Not Required ^e	Not Required	Not Required	Not Required	Not Required
	501-2,500	Not Required ^a	Yes ⁱ	Not Required ^e	Not Required	100	40	100,000
	2,501-12,000 Public accessible	Yes	Not Required	Not Required ^e	Not Required	100	40	400,000
	2,501-12,000 Nonpublic accessible (Option 1)	Yes	Not Required	Not Required ^e	Not Required	100	40	400,000
	2,501-12,000 Nonpublic accessible (Option 2)	Not Required ^a	Yes	Yes	Yes ^j	100	30 ^f	200,000
	12,001-20,000	Yes	Not Required	Yes	Yes ^j	100	40	400,000
	20,001-500,000	Yes	Not Required	Yes	Yes ^j	100	40	400,000
	Greater than 500,000 ^g	Yes	Not Required	Yes	Yes ^j	100	40	400,000
High hazard	0-500	Not Required ^a	Not Required	Not Required ^e	Not Required	50	Not Required	Not Required
	501-2,500 Public accessible	Yes	Not Required	Not Required ^e	Not Required	50	30	75,000
	501-2,500 Nonpublic accessible (Option 1)	Yes	Not Required	Not Required ^e	Not Required	50	30	75,000
	501-2,500 Nonpublic accessible (Option 2)	Not Required ^a	Yes	Yes	Yes ^j	50	20	50,000
	2,501-300,000	Yes	Not Required	Yes	Yes ^j	50	30	75,000
	300,001-500,000 ^{g, h}	Yes	Not Required	Yes	Yes ^j	50	30	75,000

- a. Where automatic sprinklers are required for reasons other than those in Chapter 32, the portion of the sprinkler system protecting the high-piled storage area shall be designed and installed in accordance with Sections 3207 and 3208.
- b. For aisles, see Section 3206.9
- c. Piles shall be separated by aisles complying with Section 3206.9.
- d. For storage in excess of the height indicated, special fire protection shall be provided in accordance with Note g where required by the fire code official. See Chapters 51 and 57 for special limitations for aerosols and flammable and combustible liquids, respectively.
- e. Section 503 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 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 Section 706 of the *International Building Code* shall be used to divide high-piled storage exceeding 500,000 square feet in area.
- i. Not required where an automatic fire-extinguishing system is designed and installed to protect the high-piled storage area in accordance with Sections 3207 and 3208.
- j. Not required where storage areas are protected by either early suppression fast response (ESFR) sprinkler systems or control mode special application sprinklers with a response time index of $50(m \cdot s)^{1/2}$ or less that are listed to control a fire in the stored commodities with 12 or fewer sprinklers, installed in accordance with NFPA 13.

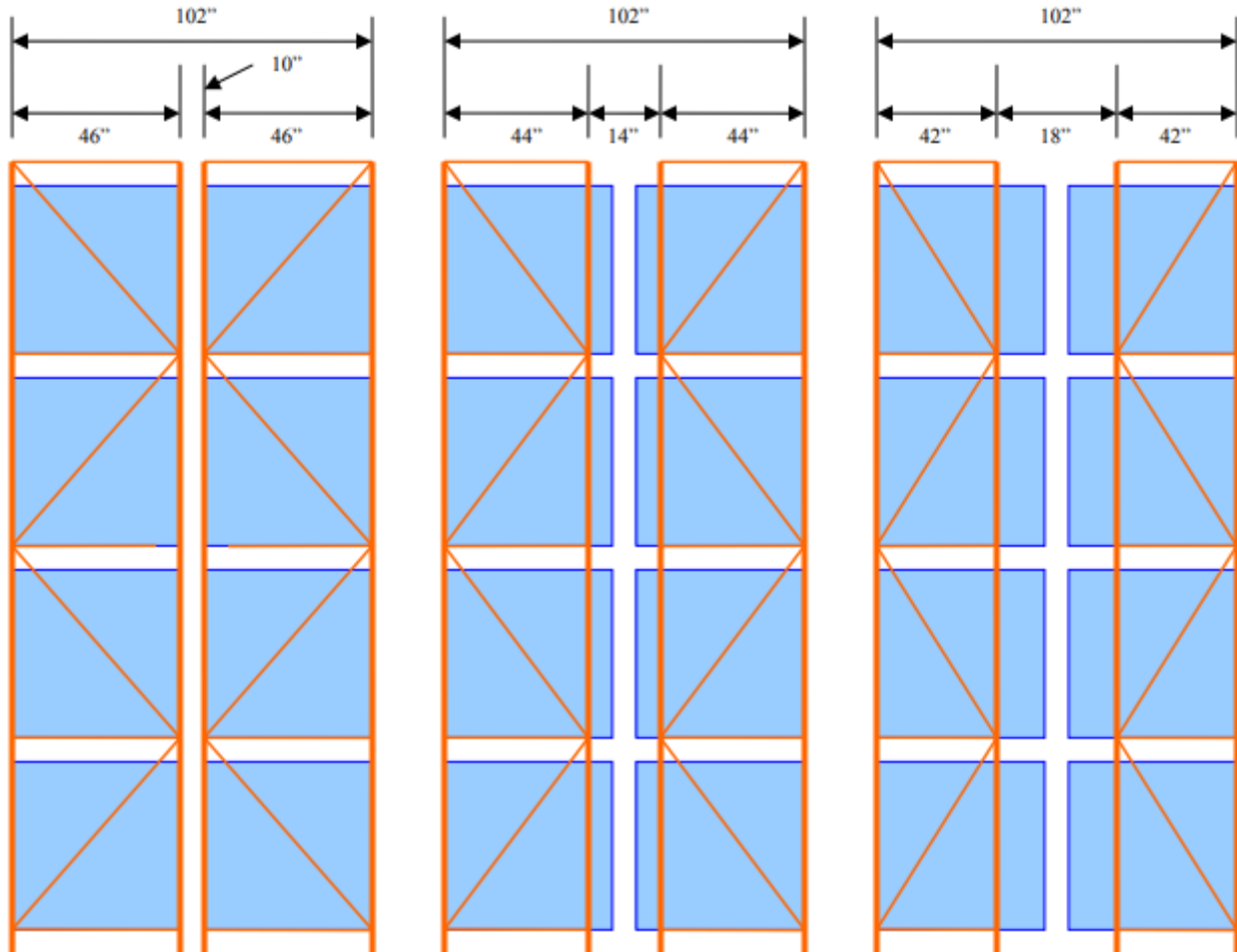
TABLE 3208.3: REQUIRED FLUE SPACES FOR RACK STORAGE

RACK CONFIGURATION	AUTOMATIC SPRINKLER PROTECTION		SPRINKLER AT THE CEILING WITH OR WITHOUT MINIMUM IN-RACK SPRINKLERS			IN-RACK SPRINKLERS AT EVERY TIER	NONSPRINKLERED
			≤ 25 feet		> 25 feet	Any height	Any height
	Storage height		Option 1	Option 2			
Single-row rack	Transverse flue space	Size ^b	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 ^b	6 inches ^a	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
Multirow rack	Transverse flue space	Size ^b	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

- a. Three-inch transverse flue space shall be provided not less than every 10 feet where ESFR sprinkler protection is provided.
- b. Random variations are allowed, provided that the configuration does not obstruct water penetration.

ATTACHMENT 1

LOAD BEAM CONFIGURATION NOT REQUIRING PALLET STOPS



NOTE:

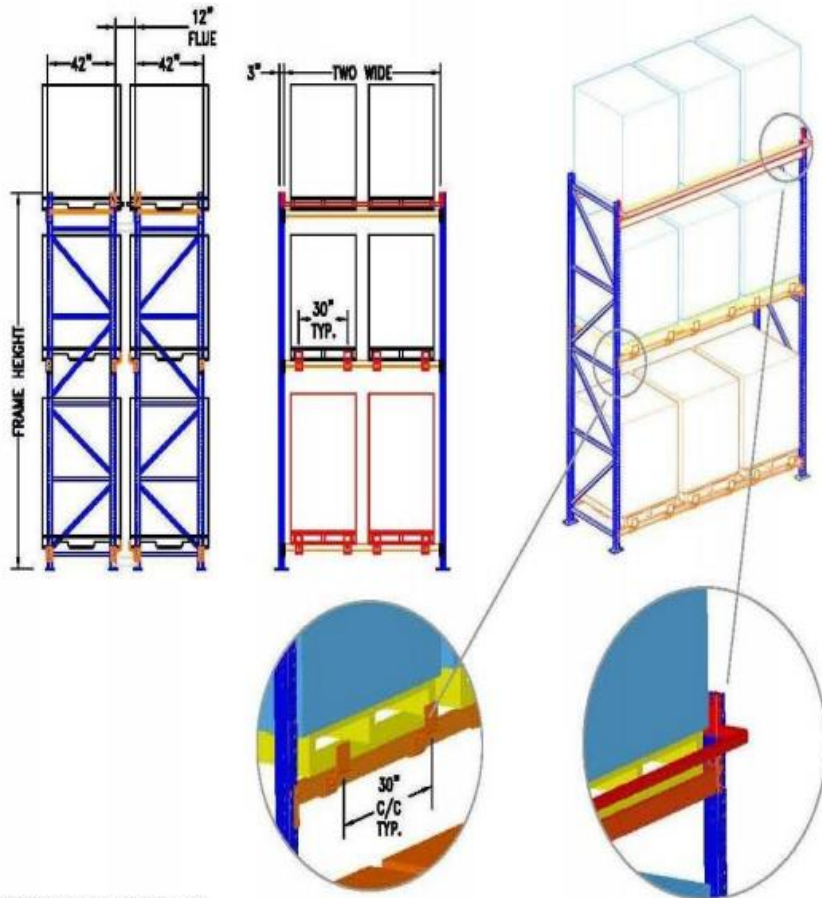
1. Maximum pallet depth 48"
2. Storage on load beam only. No shelving, wire mesh grating, or pallet supports.
3. 6" flue space shall be maintained at all times.

NOTE:

1. When 46" uprights are installed with a 10" row spacer and a typical 48"x40" pallet is used, no pallet stops are required.
2. When 44" uprights are installed with a 14" row spacer and a typical 48"x40" pallet is used, no pallet stops are required.
3. When 42" uprights are installed with an 18" row spacer and a typical 48"x40" pallet is used, no pallet stops are required.

ATTACHMENT 2

STORAGE CONFIGURATION REQUIRING PALLET STOPS



NOTES:

RACKS WITH OPEN SHELVES SUPPORTING PALLETS SHALL BE PROVIDED WITH A PALLET / COMMODITY STOP.

FOR ROLL FORM RACKING A FULL LENGTH FRAME MOUNTED SUPPORT IS TO BE USED PER THE ATTACHED DETAIL.

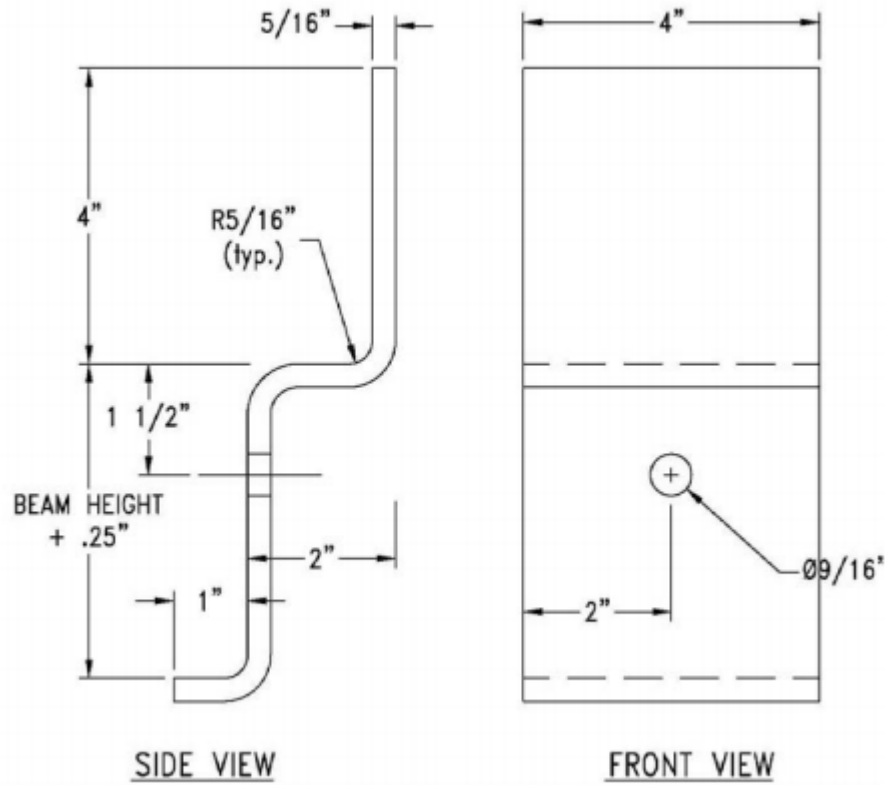
FOR STRUCTURAL (C-CHANNEL TYPE) RACKING, USE A BOLT IN Z TYPE SUPPORT ON 30" CENTERS PER THE ATTACHED DETAIL.

PS-X (PALLET STOPS - LENGTH") - USED FOR STRUCTURAL C CHANNEL BEAMS
SEE ATTACHMENT 3

PBS-XX (PALLET BACK STOP - LENGTH")
ATTACHED 4" FROM TOP OF LOAD BEAM
USED FOR ROLL FORM RACKING BEAMS
STOP CAN BE USED FOR DECKED RACK IF
ON 12" VERTICAL CENTERS - SEE
ATTACHMENT 4

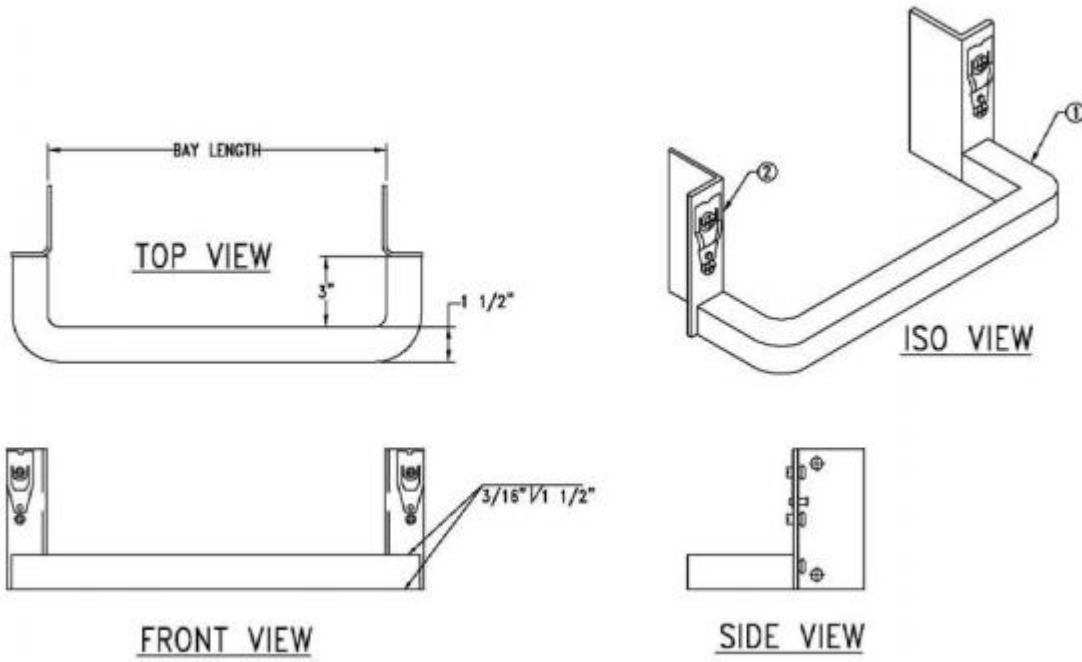
ATTACHMENT 3

STRUCTURAL "C" CHANNEL BEAM DETAIL



ATTACHMENT 4

ROLL FORM RACKING DETAIL



ATTACHMENT 5

PALLET STOP CLEAR SPACE

