

National Fire Codes[®] 1985

National Fire Codes®

A Compilation of NFPA Codes, Standards,
—Recommended Practices, Manuals and Guides

Volume 5



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of the *National Fire Codes* published by the National Fire Protection Association. The complete set contains the codes, standards, recommended practices, manuals and guides developed by the technical committees of the Association and processed in accordance with the NFPA Regulations Governing Committee Projects.

National Fire Protection Association
Batterymarch Park, Quincy, MA 02269

NATIONAL FIRE PROTECTION ASSOCIATION

Batterymarch Park, Quincy, MA 02269

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. The Association is an international, charitable, technical and educational organization. Its membership includes over one hundred and fifty national and regional societies and associations and over thirty-two thousand individuals, corporations, and organizations. Anyone interested may become a member; membership information is available on request.

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National Fire Codes

The *National Fire Codes* are annual compilations of the Codes, Standards, Recommended Practices, Manuals, Guides and Model Laws prepared by Technical Committees organized under NFPA sponsorship in accordance with the published procedures of the Association. Only those documents which have been adopted by the Association are included in the *National Fire Codes*.

The Board of Directors of the Association appoints persons from those vitally interested, qualified, and active in the areas with which the Committees are concerned so as to achieve a fair balance of affected interests. All service on these NFPA Technical Committees is contributed voluntarily in support of the Association's program for firesafety. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accept any liability resulting from compliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text. Users should realize that complete reliance for firesafety can never rest exclusively on any single safeguard.

The committees responsible for the various texts published herein are given in the introductory sections preceding each. Current committee lists are published in the *NFPA Yearbook*, which may be obtained from the Association. Official records of the adoption of each standard will be found in the *NFPA Technical Committee Reports*, the *Technical Committee Documentation* and *Fire Journal*, a bimonthly membership publication of the Association.

Volumes 1 through 6 contain documents which have been judged suitable for legal adoption and enforcement (Codes and Standards).

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Policy adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Official NFPA Definitions

Extracted from the *Regulations Governing Committee Projects*

Section 2. Terms and Definitions.

2-2 Definitions. Where the following terms, commonly found in the Association Committee Documents, are used or defined in the body of the text of a Standard, Code, Recommended Practice, Manual or Guide, they shall be consistent with the intent of these meanings, but these "definitions" may be altered by a Committee to fit the individual needs of the Document. Such altered definition shall be clear and unambiguous in the context in which it is used.

Approved: means "acceptable to the authority having jurisdiction."

NOTE: The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Authority Having Jurisdiction: The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA Documents in a broad manner since jurisdictions and "approval" agencies vary as do their responsibilities. Where public safety is primary, the "authority having jurisdiction" may be a federal, state, local, or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances, the property owner or his designated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

Code: A Document containing only mandatory provisions using the word "shall" to indicate requirements and in a form generally suitable for adoption into law. Ex-

planatory material may be included only in the form of "fine print" notes, in footnotes, or in an appendix.

Labeled: Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Listed: Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

Manual or Guide: A Document which is informative in nature and does not contain requirements.

Recommended Practice: A Document containing only advisory provisions (using the word "should" to indicate recommendations) in the body of the text.

Shall: Indicates a mandatory requirement.

Should: Indicates a recommendation or that which is advised but not required.

Standard: A Document containing only mandatory provisions using the word "shall" to indicate requirements. Explanatory material may be included only in the form of "fine print" notes, in footnotes, or in an appendix.

Notes and footnotes are informative only and are not mandatory.

NOTICE

All questions or other communications relating to documents in this volume should be sent only to NFPA Headquarters, addressed to the attention of the Committee responsible for the document.

For information on obtaining Formal Interpretations of the documents, proposing Tentative Interim Amendments, proposing amendments for Committee consideration, and on matters relating to the content of the document, write to the Secretary, Standards Council, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

A statement, written or oral, that is not processed in accordance with Section 16 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

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**Standard for
Storage of Rubber Tires**

NFPA 231D-1980

1980 Edition of NFPA 231D

This 1980 edition of NFPA 231D, *Standard for Storage of Rubber Tires*, was prepared by the Technical Committee on Storage of Rubber Tires and was adopted by the National Fire Protection Association, Inc. on November 18, 1980, at its Fall Meeting in San Diego, California. It was released for publication by the Standards Council on December 10, 1980.

It has been approved by the American National Standards Institute.

Origin and Development of NFPA 231D

A tentative standard on the storage of rubber tires was developed by a Subcommittee of the Committee on General Storage and adopted by the National Fire Protection Association, Inc. at the 1974 Annual Meeting in Miami Beach, Florida.

The first official edition of NFPA 231D was prepared by the Committee on General Storage. It included revisions made to the tentative standard, and was adopted by the Association at the 1975 Fall Meeting in Pittsburgh, Pennsylvania.

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(Rep. NFPA Industrial Fire Protection Section)
James R. Schifiliti, Schirmer Engineering Corp.
Theodore J. Zrinscak, American Risk Management Inc.

Alternates

J. S. Barritt, Industrial Risk Insurers
(Alternate to R. S. Peck)
R. J. Praetz, Factory Mutual Research Corp.
(Alternate to Factory Mutual Research Corp.)
W. P. Thomas, Jr., Kemper Insurance Cos.
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Allen D. Walters, American Warehousemen's Assn.
(Alternate to R. C. Geib)

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NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or of any document developed by the Committee on which the member serves.

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Standard for Storage of Rubber Tires

NFPA 231D-1980

NOTICE: An asterisk (*) following the number designating a paragraph or section in the text indicates explanatory material on that paragraph or section in Appendix A.

A dagger (†) following the number designating a paragraph or section in the text indicates additional suggestions with regard to that paragraph or section in Appendix B.

Chapter 1 Introduction

1-1 Scope.

1-1.1 This standard applies to the storage of rubber tires when stored indoors.

1-1.2 The provisions contained in this standard apply to new facilities for tire storage and when converting existing buildings to tire storage occupancy. It may be used as a basis for evaluating existing storage facilities.

1-1.3 This standard is not intended to apply to small scale storage as defined in Section 1-2.

1-2 Definitions.

Approved. Means "acceptable to the authority having jurisdiction."

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Available Height for Storage. The maximum height at which tires can be stored above the floor and still maintain adequate clearance from structural members and the required clearance below sprinklers.

Bundled Tires. A storage method in which a number of tires are strapped together. (See Figure 1-2.8.)

Conventional Pallet. A material handling aid designated to support a unit of load with stringers to provide support for material handling devices.

Horizontal Channel. Any uninterrupted space in excess of 5 ft (1.5 m) in length between horizontal layers of stored tires. Such channels may be formed by pallets, shelving, racks or other storage arrangements.

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

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NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The "authority having jurisdiction" should utilize the system employed by the listing organization to identify a listed product.

On-floor Storage. Tires stored directly on the floor without horizontal channels. Such storage may utilize boards, cardboard tubes or similar storage aids, but not pallets or racks.

On-side Storage. Tires stored horizontally or flat. (See Figure 1-2.6.)

On-tread Storage. Tires stored vertically or on their treads. (See Figure 1-2.7.)

Palletized. Storage on portable racks of various types utilizing a conventional pallet as a base.

Pyramid Storage. On-floor storage in which tires are pyramided to provide pile stability.

Rack. Any combination of vertical, horizontal and diagonal members which support stored materials. Racks may be fixed or portable. A fixed rack is a supporting framework which remains in a fixed position within the warehouse during normal usage and into which the placement and retrieval of storage is through the handling of tires individually or in pallets loads. (See Figures 1-2.1 to 1-2.8.)

Rubber Tires. Pneumatic tires for passenger automobiles, aircraft, light and heavy trucks, trailers, farm equipment, construction equipment (off-the-road) and buses.

Shall. Indicates a mandatory requirement.

Should. Indicates a recommendation or that which is advised but not required.

Small Scale Storage. Storage of less than 10,000 units.

Storage Aids. Commodity storage devices such as shelves, pallets, dunnage, separators and skids.

Units (equivalent passenger)*. One average size passenger tire weighing approximately 25 lb (11 kg).

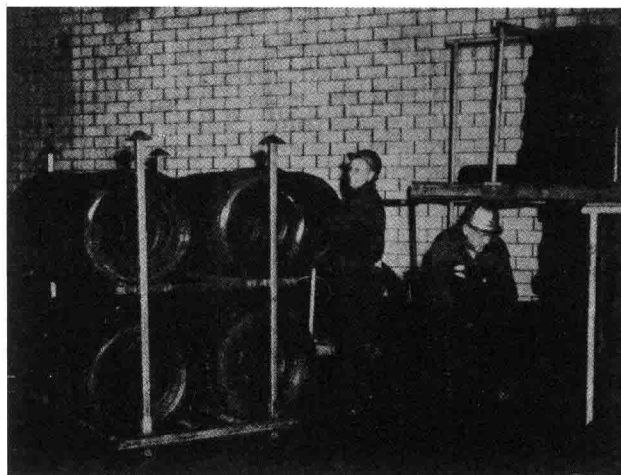


Figure 1-2.3 Open Portable Racks

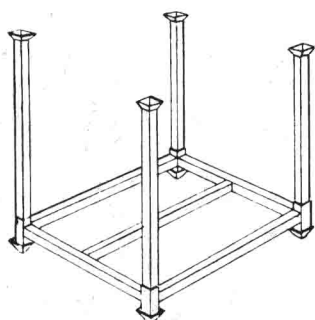


Figure 1-2.1 Open Portable Rack Unit

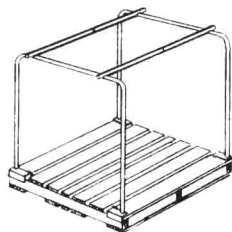
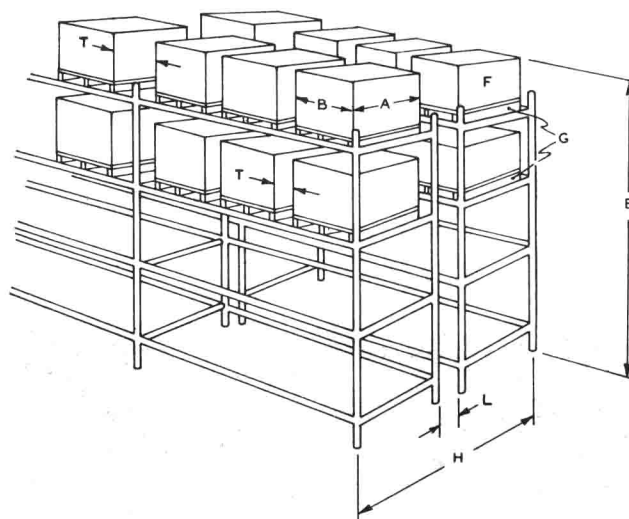


Figure 1-2.2 Palletized Portable Rack Unit



Legend

A — Load Depth
B — Load Width
T — Transverse Flue Space
L — Longitudinal Flue Space

E — Storage Height
F — Commodity
G — Pallet
H — Rack Depth

Figure 1-2.4 Double Row Racks without Solid or Slatted Shelves

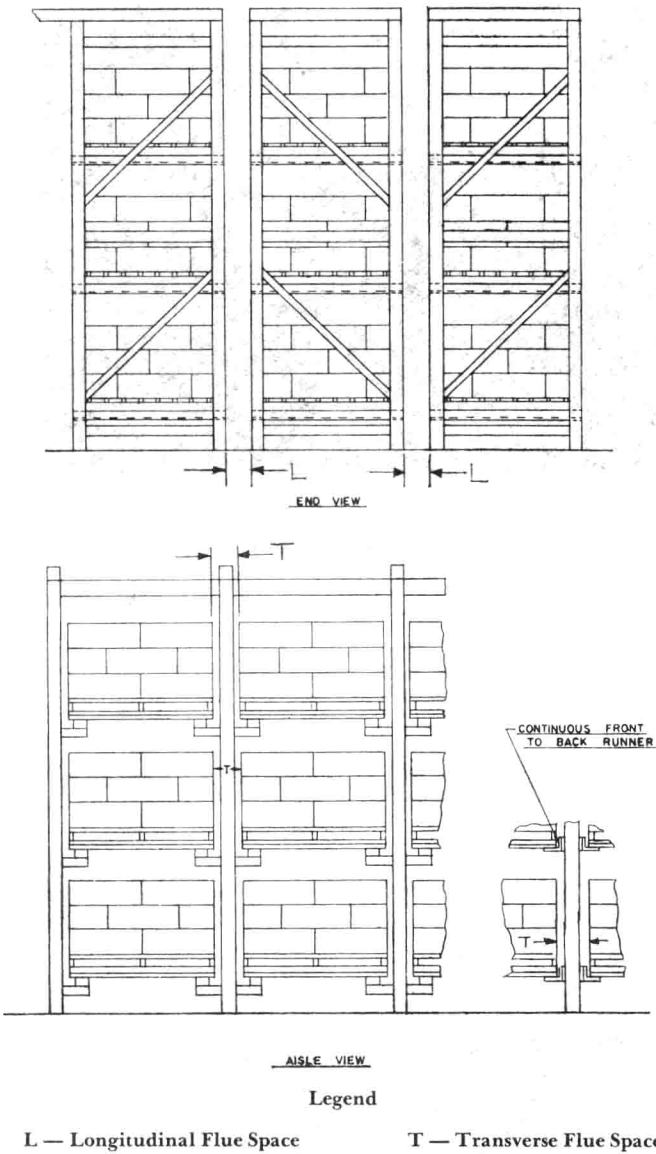


Figure 1-2.5 Multiple-Row Rack

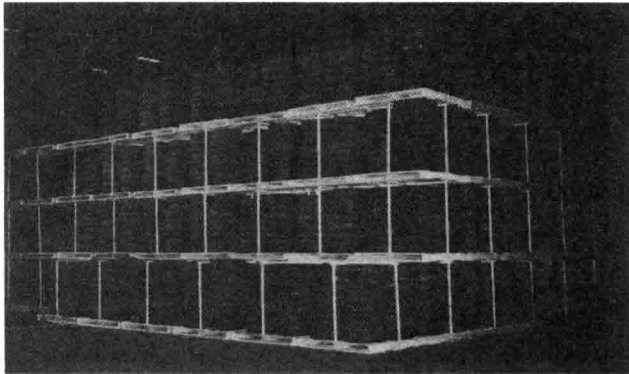


Figure 1-2.6 Palletized Portable Rack On-Side Storage Arrangement

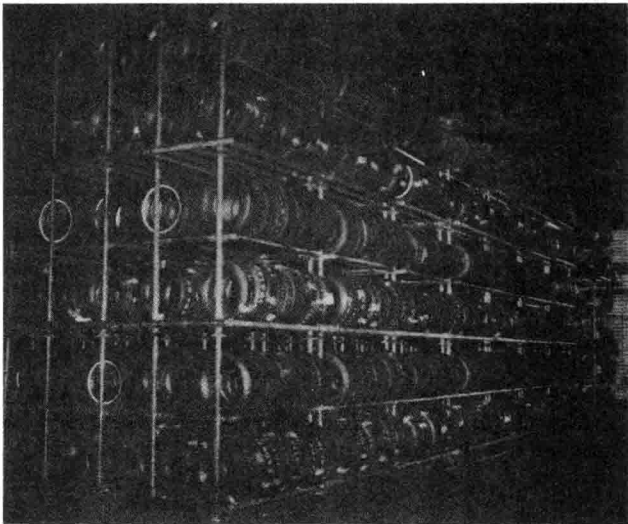


Figure 1-2.7 Open Portable Rack On-Tread Storage Arrangement

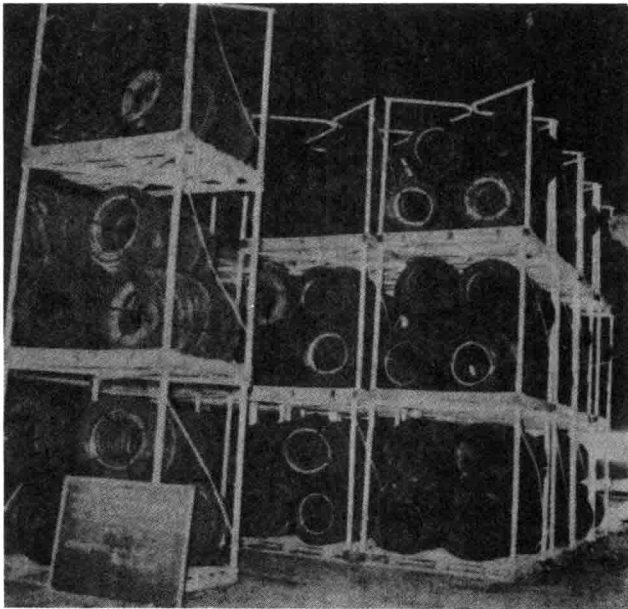


Figure 1-2.8 Bundled Tires — Palletized — Portable Rack On-Tread Storage Arrangement

Chapter 2 Building Arrangement

2-1 Construction.

2-1.1* Buildings used for the storage of tires which are protected according to this standard may be of any of the types described in NFPA 220, *Standard Types of Building Construction*.

2-1.2 Steel columns shall be protected according to the following:

(a) Storage exceeding 15 ft (4.6 m) through 20 ft (6 m) in height.

One hour fireproofing or one sidewall sprinkler head directed to one side of the column at 15 ft (4.6 m) level.

(b) Storage exceeding 20 ft (6 m) in height.

Two hour fireproofing for the entire length of the column, and including connections with other structural members; or two sidewall sprinkler heads, one at the top of the column and the other at the 15-ft (4.6-m) level, both directed to the side of the column.

Exception: The above protection is not required where storage in fixed racks is protected by in-rack sprinklers.

2-2* Emergency Smoke and Heat Venting.

2-3 Fire Walls.

2-3.1 Where protection in accordance with Section 4-1 is provided, stored tires shall be segregated from other combustible storage by aisles at least 8 ft (2.4m) wide. Where not so protected, stored tires shall be cut off by fire walls.

2-3.2 When tires are stored up to 15 ft (4.6 m) high, walls between adjacent warehouse areas and between manufacturing and warehouse areas shall have not less than a 4-hr fire rating. When tires are stored over 15 ft (4.6 m) high, walls between manufacturing and warehouse areas shall have a fire rating of not less than 6 hrs.

Chapter 3 Storage Arrangement

3-1 Piling Procedures.

3-1.1 Piles shall be not more than 50 ft (15 m) in width except that piles along a wall shall not be more than 25 ft (7.6 m) in width.

Exception: Where tires are stored on tread, the dimension of the pile in the direction of the wheel hole shall be not more than 50 ft (15 m).

3-1.2 The width of main aisles between piles shall be not less than 8 ft (2.4 m).

3-2 Clearances.

3-2.1 The clearance from the top of storage to sprinkler deflectors shall be not less than 3 ft (.9 m).

3-2.2 Storage clearance in all directions from roof structures shall be not less than 3 ft (.9 m).

3-2.3 Storage clearance from ducts shall be maintained in accordance with NFPA 91, *Blower and Exhaust Systems*, Section 240.

3-2.4 Storage clearance from unit heaters, radiant space heaters, duct furnaces and flues shall not be less than 3 ft (.9 m) in all directions, or shall be in accordance with the clearance shown on the approval agency label.

3-2.5 Clearance shall be maintained to lights or light fixtures to prevent possible ignition.

3-2.6 Not less than 24 in. (.6 m) clearance shall be maintained around the path of fire door travel unless a barricade is provided.

Chapter 4 Fire Protection

4-1 Automatic Sprinkler Systems.

4-1.1 Automatic sprinklers, where provided, shall be installed in accordance with NFPA 13, *Standard for Installation of Sprinkler Systems*, except as modified in this chapter.

4-1.2* Sprinkler discharge densities and areas of application shall be in accordance with Table 4-1.2.

4-1.3 System Requirements.

4-1.3.1 For the purpose of selecting sprinkler spacings in hydraulically designed sprinkler systems, to obtain a stipulated density, 60 lb (4 atmospheres) per square in. (414 kPa) shall be the maximum discharge pressure used at the calculation starting point.

4-1.3.2 In buildings which are occupied in part for tire storage, where only a portion of the sprinkler system is hydraulically designed, the design area shall extend not less than 15 ft (4.6 m) beyond the area occupied by the tires.

4-1.4 In-Rack Sprinkler System Requirements.

4-1.4.1 The area protected by a single system of sprinklers in racks (in-rack sprinklers) shall not exceed 40,000 sq ft (3716 m²) of floor area occupied by the racks, including aisles, regardless of the number of intermediate sprinkler levels.

4-1.4.2 When sprinklers are installed in racks, separate indicating gate valves and drains shall be provided for ceiling sprinklers and sprinklers in racks, except such drains and valves are not required for small in-rack installations of less than 20 sprinklers.

4-1.4.3 Water demand of sprinklers installed in racks shall be added to ceiling sprinkler water demand at the point of connection.

4-1.4.4 Sprinklers in racks shall be ordinary temperature classification with nominal $\frac{1}{2}$ in. (12.7 mm) orifice size pendent or upright.

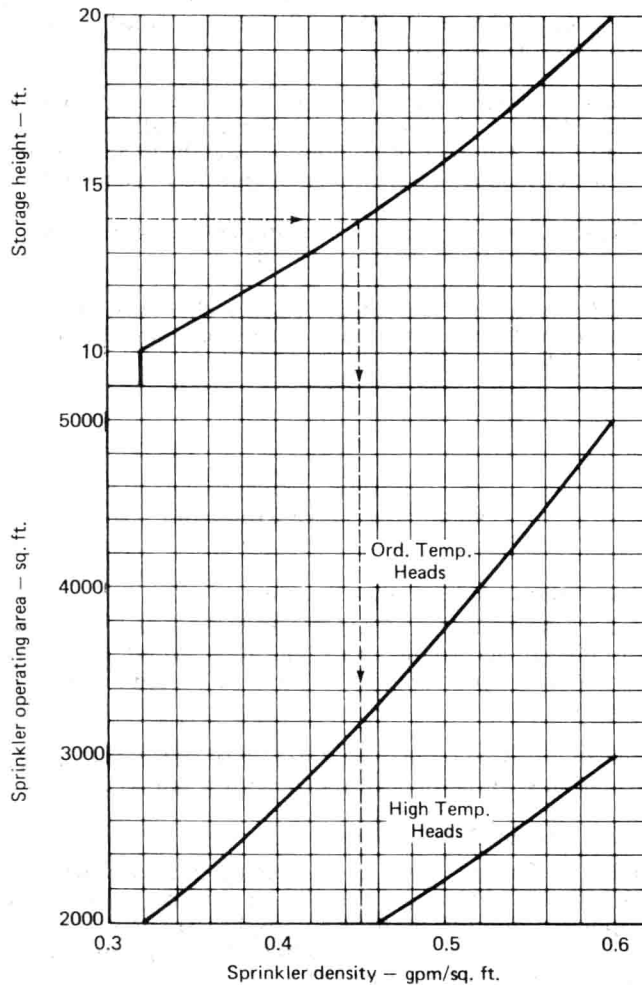


Figure 4-1.2 Sprinkler System Design Curves for Palletized Storage and Fixed Rack Storage with Pallets.

To use curves, enter at storage height (example 14 ft) (4.3 m); read density (0.45) then down to sprinkler operating area; 3200 sq ft (297 m²) for ordinary heads, 2000 sq ft (186 m²), for high temperature heads.

4-1.4.5 The number of sprinklers and the pipe sizing on a line of sprinklers in racks is restricted only by hydraulic calculations, and not by any piping schedule.

4-1.4.6 Water shields shall be provided directly above in-rack sprinklers, or listed sprinklers equipped with water shields shall be used when there is more than one level of in-rack sprinklers.

4-1.4.7 In-rack sprinkler deflectors shall be located at the same level as the bottom of the pallet support to maintain an unobstructed clear space of at least 4 in. (102 mm). In-rack sprinklers shall be located at least 2 ft (0.6 m) from rack uprights.

4-1.4.8 In-rack sprinklers at one level only for storage up to and including 20 ft (6 m) high shall be located at one half to two thirds of the storage height.

4-1.4.9 Maximum horizontal spacing of sprinklers in racks shall be 8 ft (2.4 m).

4-1.4.10 Sprinklers in racks shall discharge at not less than 30 psi (207 kPa) for all classes of commodity.

4-1.4.11 Water demand for sprinklers installed in racks shall be based on simultaneous operation of the most hydraulically remote 12 sprinklers when only one level is installed in racks.

4-2 High Expansion Foam Systems.

4-2.1* High expansion foam systems installed in accordance with NFPA 11A, *Standard for High Expansion Foam Systems*, as modified herein, may be installed in addition to automatic sprinklers. When so installed, a reduction in sprinkler discharge density to one half the density specified in Table 4-1.2 or 0.24 gal per min per sq ft [9.78 (L/min)/m²], whichever is higher, will be allowed.

4-2.2 High expansion foam systems shall be automatic in operation.

4-2.3 Detectors shall be listed and shall be installed at the ceiling at one half listed spacing in accordance with NFPA 72E, *Standard for Automatic Fire Detectors*.

4-2.4 Detection systems, concentrate pumps, generators and other system components essential to the operation of the system shall have an approved standby power source.

4-3 Water Supplies.

4-3.1 The rate of water supply shall be sufficient to provide the required sprinkler discharge density over the required area of application plus provision for generation of high expansion foam and in-rack sprinklers when used.

4-3.2 Total water supplies shall include provision for not less than 750 gal/min (2835 L) for hose streams, in addition to that required for automatic sprinklers and foam systems. Water supplies shall be capable of supplying the demand for sprinkler systems and hose streams for not less than 3 hrs.

4-3.3* Where dry pipe systems are used, the area of sprinkler application shall be increased by not less than 30 percent.

4-4 Manual Inside Protection.

4-4.1 Where automatic sprinkler protection is provided, small hose (1½ in.) (38 mm) shall be provided to reach any portion of the storage area. Small hose may be supplied from

- (a) Hydrants, or
- (b) A separate piping system for small hose stations, or
- (c) Valved hose connections on sprinkler risers where such connections are made upstream of sprinkler control valves, or
- (d) Adjacent sprinkler systems.

Table 4-1.2

Piling Method	Piling Height Feet	Sprinkler Discharge Den- sity — Gallons Per Minute Per Square Foot (See Notes 1 and 2)	Areas of Application Square Feet (See Note 1)	
			Ord. Temp. Heads	High Temp. Heads
1. On Floor				
a. Pyramid piles	$\left\{ \begin{array}{l} \text{Up to 5} \\ 5 + \text{ to } 7 \\ 7 + \text{ to } 8 \\ 8 + \text{ to } 10 \\ 10 + \text{ to } 12 \end{array} \right.$	See NFPA #13, Standard For Installation of Sprinkler Systems		
b. Other arrangement such that no horizontal channels are formed		0.24	2,000	2,000
c. Tires piled on floor on tread (See Note 3)		0.26	2,000	2,000
		0.28	2,000	2,000
d. Off the road tires		0.32	2,000	2,000
2. Palletized				
On side or tread	$\left\{ \begin{array}{l} 9 \text{ to } 20 \\ 20 + \text{ to } 30 \end{array} \right.$	See Figure 4-1.2		
		0.3 plus high expansion foam	3,000	3,000
3. Open Portable Rack Storage				
On side or tread	$\left\{ \begin{array}{l} \text{Up to 12} \\ 12 \text{ to } 20 \end{array} \right.$	0.6	5,000	3,000
		{ 0.6 0.9	(See Note 4) (See Note 4)	5,000 3,000
		or 0.3 plus high expansion foam	3,000	3,000
4. Double & Multi-row Fixed Rack Storage on Pallets				
On side or tread	$\left\{ \begin{array}{l} 9-20 \\ 20 \end{array} \right.$	See Fig. 4-1.2	—	—
		0.4 plus 1 line in- rack sprinklers	3,000	3,000
		or 0.3 plus high expansion foam	3,000	3,000
5. Double & Multi-row Fixed Rack Storage Without Pallets or Shelves				
On side or tread	$\left\{ \begin{array}{l} \text{Up to 12} \\ 12 \text{ to } 20 \end{array} \right.$	0.6	5,000	3,000
		{ 0.6 0.9	(See Note 4) (See Note 4)	5,000 3,000
		or 0.3 plus high expansion foam	3,000	3,000
		or 0.4 plus 1 line in-rack sprinklers	3,000	3,000

Notes:

1. Sprinkler discharge densities and areas of application are based on a maximum clearance of 10 feet between sprinkler deflectors and the maximum available height of storage.
2. Densities in table are based on standard sprinklers. In buildings where "old style" sprinkler heads exist, discharge densities shall be increased by 25%.
3. Piles not to exceed 25 feet in direction of wheel holes.
4. Water supply shall fulfill both requirements.

4-4.2* In locations where small hose is provided, portable fire extinguishers for Class A fires may be omitted in storage areas.

4-5 Hydrants. At locations without public hydrants, or where hydrants are not within 250 ft (76 m), private hydrants shall be installed in accordance with NFPA 24, *Standard for Outside Protection*.

4-6 Alarm Service.

4-6.1 Automatic sprinkler systems and foam systems where provided shall have approved central station, auxiliary, remote station or proprietary waterflow alarm service.

Exception: Local waterflow alarm service may be provided where recorded guard service is also provided. (See NFPA 601.)

4-6.2 Alarm service shall comply with one of the following: NFPA 71, 72A, 72B, 72C or 72D.

4-7*† Fire Emergency Organization.

4-7.1 Arrangements shall be made to permit rapid entry into the premises by the municipal fire department, police department, or other authorized personnel in case of fire or other emergency.

4-7.2 Plant emergency organizations where provided shall be instructed and trained in the following procedures:

- (a) Maintaining the security of the premises.
- (b) Means of summoning outside aid immediately in an emergency.
- (c) Use of portable extinguishers and small hose lines or small fires and mop-up operations.
- (d) Operation of the sprinkler system and water supply equipment.
- (e) Use of material handling equipment while sprinklers are still operating to effect final extinguishment.
- (f) Supervision of sprinkler valves after the system is turned off so that the system can be reactivated if rekindling occurs.

4-7.3 A fire watch shall be maintained when the sprinkler system is not in service.

Chapter 5 Building Equipment, Maintenance and Operations

5-1 Mechanical Handling Equipment.

5-1.1 Industrial Trucks. Power-operated industrial trucks shall comply with NFPA 505, *Standard for Powered Industrial Trucks, Including Type Designations and Areas of Use*.

5-2 Storage of Empty Wood Pallets. Wood pallets shall be stored in accordance with the requirements of NFPA 231, *Indoor General Storage*, Section 4-4.

5-3 Cutting and Welding Operations.

5-3.1 When welding or cutting operations are necessary, the precautions contained in NFPA 51B, *Cutting and Welding Processes*, shall be followed. When possible, work shall be removed to a safe area.

5-3.2 Welding, soldering, brazing, and cutting may be performed on rack or building components which cannot be removed, provided no storage is located below and within 25 ft (7.6m) of the working area, and flameproof tarpaulins enclose this section. During any of these operations the sprinkler system shall be in service. Extinguishers suitable for Class A fires with a minimum rating of 2A and charged inside hose lines where provided shall be located in the working area. A fire watch shall be maintained during these operations and for not less than 30 min following completion of open flame operation.

5-4 Waste Disposal. Rubbish, trash, and other waste material shall be disposed of at regular intervals. (See NFPA 82, *Standard on Incinerators and Rubbish Handling*, Section 80.)

5-5 Smoking. Smoking shall be strictly prohibited, except in locations prominently designated as smoking areas. "No Smoking" signs shall be posted in prohibited areas.

5-6 Maintenance and Inspection.

5-6.1 Fire walls, fire doors, and floors shall be maintained in good repair at all times.

5-6.2* The sprinkler system and the water supplies shall be maintained and serviced.

Appendix A

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

A-1-2 Units. One H78-14 passenger tire weighs about 25 lb (11 kg). One heavy service (truck) tire, size 10.00-20 weighs above 100 lb (45 kg) and is equivalent to four passenger units. Light heavy service tires vary in size and weight from passenger size to heavy service size—on the average being about 2½ equivalent passenger units. Other types of tires are found in a broad range of sizes. Except in large warehouses they are not likely to be encountered in significant quantities.

A-2-1.1 Building codes and insurance requirements may affect the type of construction selected.

A-2-2 Smoke removal is important to manual fire-fighting and overhaul. Since most fire tests were conducted without smoke and heat venting, protection specified in Section 4-1 was developed without the use of such venting. However, venting through eave-line windows, doors, monitors, gravity or mechanical exhaust systems is essential to smoke removal after control of the fire is achieved.

A-4-1.2 Density and areas of application in Table 4-1.2 have been developed from fire test data. Protection requirements for other storage methods are beyond the scope of the standard at the present time. From recent fire testing with densities (0.45 gpm/sq ft and higher) [(18.3 L/min)/m²] there have been indications that large orifice sprinklers at greater than 50 sq ft (4.6 m²) spacing produce better results than the ½ in. (12.7 mm) orifice sprinklers at 50 sq ft (4.6 m²) spacing.

A-4-2.1 In existing buildings to be used for tire storage, high expansion foam might be used to augment an existing sprinkler system whose calculated density was below that required for the proposed storage height. For example, an existing system calculated to provide 0.25 gpm/sq ft [(10.2 L/min)/m²] could be used for storages requiring up to 0.50 gpm/sq ft [(20.3 L/min)/m²] with the addition of a high expansion foam system. An alternative may be to reinforce or redesign the sprinkler system.

A-4-3.3 Wet systems are recommended for tire storage occupancies. Dry systems are acceptable only where it is impracticable to provide heat.

A-4-4.2 Extinguishers should be provided for adjacent areas such as offices, shops, boiler rooms, electrical switch rooms, truck service areas, etc. If cutting or welding is contemplated, extinguishers will also be needed. Size, spacing and type of extinguisher to be in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

A-4-7 (See also *Appendix B*.) Information on emergency organization is given in NFPA 27, *Recommendations for Organization, Training and Equipment of Private Fire Brigades*.

A-5-6.2 See NFPA 13A, *Care and Maintenance of Sprinkler Systems*, for guidance.

Appendix B

This Appendix is not a part of the requirements of this document, but is included for information purposes only.

B-4-7 Suggestions for Fighting Rubber Tire Fires in Sprinklered Buildings.

Introduction. Observations at tire fire tests have indicated that while automatic sprinklers with adequate

discharge densities can control a fire, extinguishment by sprinklers alone is not to be expected. It is essential that the behavior of this type of fire be understood if control is not to be lost in the overhaul stage.

Incipient Stage. If caught in the incipient stage control can often be effected. Dry chemical type extinguishers have been found effective since the powder will pass into the mass of tires and knock down flame temporarily. It is necessary to back up extinguishers with small hose, and to remove affected tires from the pile. Tires thus removed should be taken out of doors, thoroughly soaked and left where they do not expose other combustibles. The area in which the fire occurred should be constantly attended for several hours to watch for rekindling.

Automatic sprinklers can be expected to operate within 2 to 5 min of ignition. At this point, the fire has generally progressed beyond the stage where extinguishers are effective and within a few minutes, smoke will make the area untenable and vision will be completely obscured.

Active Stage. At this point, the building is untenable and obscured vision makes the use of hose streams questionable. It is best to allow the sprinklers to take control of the fire. Most sprinklers will have operated within 15 to 20 min of ignition if control is to be effected. Sprinklers should be allowed to operate at least 60 and preferably 90 min. During the period the building is best left unventilated. As control of the fire is gained, smoke will tend to change from black to gray and diminish in intensity. During this period at least six charged 1½-in. (38 mm) hose lines should be laid out preparatory to entering the building. Portable floodlights should be secured as well as raincoats, boots, helmets, breathing apparatus, etc., for the overhaul crew.

Critical Stage. After 60 to 90 min and when smoke intensity has diminished, the building should be ventilated around the periphery of the suspected fire location. During this period close observation should be made of smoke conditions. If smoke generation increases, cease ventilating and close up building if possible.

Overhaul. As soon as smoke clears to the extent that the building can be entered, entry should be made with small hose streams which should be directed into burning tires. Sprinklers should remain in operation unless the fire chief is certain that hose can control the fire.

Fork trucks and other means should be employed to remove tires from the fire area. It will usually be necessary to keep sprinklers and/or hose streams in operation during this procedure at least until all evidence of flame is gone. Patrols should be made in affected area for 24 hrs following the fire.

In the event that control of the fire is lost as evidenced by increasing smoke generation, loss of pressure at fire pump discharge indicating massive sprinkler operation, collapsing roof, etc., efforts should be directed towards preventing the spread of the fire beyond the area bounded by the fire walls. At this point, consideration should be given to shutting off sprinklers in the fire area to provide water for protecting the exposures.