

## NFPA 230 — November 2002 ROP

### Report of the Committee on

#### General Storage

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**Kerry M. Bell**, Underwriters Laboratories Inc., IL [RT]  
**Michael H. Blumenthal**, Rubber Manufacturers Association, DC [M]  
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**James S. Crews**, Fireman's Fund Insurance Company, GA [I]  
**T. E. (Ted) Dalferes**, Carter and Burgess, Inc., TX [IM]  
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**James G. Gallup**, The RJA Group, Inc., AZ [SE]  
**Thomas Goonan**, Tom Goonan Associates, VA [SE]  
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**Russell B. Leavitt**, TVA Fire & Life Safety, Inc., CA [IM]  
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**Albert W. Reed**, Reed Fire Protection Engineering, TX [SE]  
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**Todd E. Schumann**, Industrial Risk Insurers, IL [I]  
**Peter A. Smith**, International Paper Company, TN [U]  
**Robert Spaulding**, FM Global, MA [I]  
**Jack Thacker**, Allan Automatic Sprinkler Corp. of So. California, CA [IM]  
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#### Alternates

**James J. Convery**, Gage-Babcock & Associates, VA [SE]  
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(Alt. to J. Thacker)  
**Kevin Maughan**, Central Sprinkler Company, PA [M]  
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**Daniel R. Steppan**, Underwriters Laboratories Inc., IL [RT]  
(Alt. to K. M. Bell)

#### Nonvoting

**Martin M. Brown**, Laguna Woods, CA  
(Member Emeritus)

Staff Liaison: **Dana R. Haagensen**

**Committee Scope:** This Committee shall have primary responsibility for documents on safeguarding general warehousing and commodities against fire where stored indoors or outdoors. This Committee does not cover storage that is specifically covered by other NFPA standards.

*This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the front of this book.*

The Report of the Technical Committee on **General Storage** is presented for adoption.

This Report was prepared by the **Technical Committee on General Storage** and proposes for adoption, amendments to NFPA 230, **Standard for the Fire Protection of Storage**, 1999 edition. NFPA 230 is published in Volume 6 of the 2001 National Fire Codes and in separate pamphlet form.

This Report has been submitted to letter ballot of the **Technical Committee on General Storage** which consists of 28 voting members. The results of the balloting, after circulation of any negative votes, can be found in the report.

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230-1-(1-4 Fines (New)) : Accept in Principle (Log #4)  
**SUBMITTER:** Ken Bush,  
**RECOMMENDATION:** Add a new definition of "Fines" to read:  
Fines. Small pieces or splinters of wood by-products that will pass through a 0.25-inch (6.4 mm) screen.  
**SUBSTANTIATION:** The definition of "Fines" provides a threshold to assist the authority having jurisdiction in understanding the distinction between them and dust or other particulate.  
**COMMITTEE ACTION:** Accept in Principle  
Accept proposal and place in new Chapter 3 - Definitions.  
**COMMITTEE STATEMENT:** The committee agrees that material regarding storage of forest products should be located in the body of the standard. The committee is accepting in principle so that a task group can be formed to recommend specific language. The committee and task group would like to encourage comments with technical justification on this material.  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-2-(1-4 Flashover) : Accept (Log #CP25)  
**SUBMITTER:** Technical Committee on General Storage,  
**RECOMMENDATION:** Revise the definition of "flashover" to read as follows:  
Flashover. For the storage of baled cotton, see definition of Flameover.  
**SUBSTANTIATION:** To clarify that the definition of "Flashover" provided in NFPA 230 is unique to the storage of baled cotton.  
**COMMITTEE ACTION:** Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 20  
NEGATIVE: 1  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith  
**EXPLANATION OF NEGATIVE:**  
SCHUMANN: If the second sentence is correct in stating that flashover in the common term used in the cotton industry, why have a flameover definition? It is proposed to add a definition for flashover and revise the flameover definition as follows:  
Flameover. A fire that spreads rapidly over the exposed linty surface of the cotton bales. ~~In the cotton industry, the common term is flashover and has the same meaning.~~  
Flashover. A stage in the development of a contained fire in which all exposed surfaces reach ignition temperatures more or less simultaneously and fire spreads rapidly throughout the space. (From NFPA 101)

230-3-(1-4 Horizontal Channel) : Accept (Log #CP24)  
**SUBMITTER:** Technical Committee on General Storage,  
**RECOMMENDATION:** Adopt the Glossary of Terms preferred definition for the term "horizontal channel" as follows:  
Horizontal Channel. Any uninterrupted space in excess of 1.5 m (5 ft) in length between horizontal layers of stored tires. Such channels are formed by pallets, shelving, racks, or other storage arrangements.  
**SUBSTANTIATION:** Adoption of preferred definitions will assist the user by providing consistent meaning of defined terms throughout the National Fire Codes.  
**COMMITTEE ACTION:** Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-4-(3-1.3) : Accept in Part (Log #19)  
**SUBMITTER:** Rick Thornberry, The Code Consortium Inc./Rep. AAMA Smoke Vent Task Group  
**RECOMMENDATION:** Revise text as follows:  
3-1.3\* Emergency Smoke and Heat Venting. Protection outlined in this standard shall apply to buildings with or without roof automatic smoke and heat vents and draft curtains.  
Exception: Where local codes require automatic smoke and heat and smoke vents in buildings protected by early suppression fast response (ESFR) sprinklers, the vents shall be manually operated or have an

operating mechanism with a standard response fusible element rated no less than 360°F (182°C).  
**SUBSTANTIATION:** This proposal is merely a clarification of the use of the appropriate terminology for vents installed in the roofs of one-story buildings to provide for emergency smoke and heat venting. The latest edition of NFPA 204 will be the 2002 edition which is presently undergoing the NFPA standards revision process. The title of that standard is Standard for Smoke and Heat Venting. The term "smoke and heat vents" is a standard term within the industry. Also, the issue with these vents as evidenced by the Exception is when they are automatically operated due to the concerns that they may potentially adversely affect the operation of ESFR sprinklers. That is the reason the Exception was provided which states that the vents must either be manually operated or have an operating mechanism with a fusible link rating of not less than 360°F. If the smoke and heat vents were not automatically operated, there would be no need to provide the Exception since those vents would only be manually opened by the responding fire department well after the initial sprinklers have operated.  
Also, the word "roof" is not necessary since automatic smoke and heat vents are designed and listed for installation in roofs.  
**COMMITTEE ACTION:** Accept in Part  
Accept proposal as worded but eliminating the term "automatic"  
**COMMITTEE STATEMENT:** Not all required smoke and heat vents operate automatically.  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-5-(3-1.3) : Reject (Log #20)  
**SUBMITTER:** Rick Thornberry, The Code Consortium Inc./Rep. AAMA Smoke Vent Task Group  
**RECOMMENDATION:** Revise text as follows:  
3-1.3\* Emergency Smoke and Heat Venting. Protection outlined in this standard shall apply to buildings with or without roof vents and draft curtains.  
Exception: Where local codes require heat and smoke vents in buildings protected by early suppression fast response (ESFR) sprinklers, the following conditions shall apply:  
1. the Vents shall be manually operated or have an operating mechanism with a standard response fusible element rated no less than 360°F (182°C).  
2. Draft curtains shall be installed between areas protected with ESFR sprinklers and adjacent areas protected with conventional sprinklers but not within the areas protected with ESFR sprinkler.  
**SUBSTANTIATION:** To make the Exception of Section 3-1.3 more complete in an effort to assure that ESFR sprinklers operate properly, we have proposed this additional text to indicate how draft curtains are to be installed in relationship to areas protected with ESFR sprinklers and areas that are not.

The proposed text is basically taken from Footnote 2 to Table 81-B of the 2000 WFC A Uniform Fire Code. It is also similar to requirements contained in Chapter 23 of the 2000 ICC International Fire Code for high-piled combustible storage buildings.  
This is also consistent with the Factory Mutual System Loss Prevention Data Sheet 2-2 dated May 19, 1995, entitled "Installation Guidelines for Early Suppression-Fast Response Sprinklers." In fact, it is based on fire tests and studies conducted by Factory Mutual Research which indicate that draft curtains can adversely affect the proper performance of ESFR sprinklers but serve a very useful purpose if they provide a separation between areas protected with ESFR sprinklers and those areas that are protected with other types of sprinklers. In such cases, they may actually improve the operation of the ESFR sprinklers.  
**COMMITTEE ACTION:** Reject  
**COMMITTEE STATEMENT:** This issue is addressed in Section 5-4.6.4 of NFPA 13 (1999).  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-6-(3-1.3.1 (New)) : Reject (Log #21)  
**SUBMITTER:** Rick Thornberry, The Code Consortium Inc./Rep. AAMA Smoke Vent Task Group  
**RECOMMENDATION:** Add a new Section 3-1.3.1 et al to read as follows:  
3-1.3.1 Where Required. Smoke and heat vents and draft curtains complying with this section shall be installed in one-story buildings

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used for storage having over 50,000 ft.<sup>2</sup> (4645 m<sup>2</sup>) in undivided area and in buildings having over 12,000 ft.<sup>2</sup> (1115 m<sup>2</sup>) of storage 12 ft. (3.7 m) or greater in height in accordance with the provisions of this section.

3-1.3.2 Types of Vents. Vents shall be activated by temperature and shall open automatically in the event of fire.

3-1.3.2.1 Smoke and heat vents shall be approved and shall be listed and labeled for the purpose.

3-1.3.2.2 Smoke and heat vents shall be operated automatically by activation of any one of the following:

1. An approved fixed-temperature heat-responsive device rated between 100 and 200°F (56 and 111°C) above estimated ambient temperatures,
2. An approved rate-of-rise device, or
3. Approved heat-sensitive glazing designed to shrink and drop out of the vent opening.

3-1.3.2.3 The heat-responsive device shall be listed and labeled.

3-1.3.2.4 Smoke and heat vents shall also have the capability of being opened by an approved manual operation.

3-1.3.2.5 Vents shall meet the design criteria of Section 3-1.3.3 regarding elevation and Section 3-1.3.4 regarding venting area, dimensions, spacing, and venting ratios. The authority having jurisdiction shall be authorized to require documentation of the design to ensure proper performance of required venting in accordance with NFPA 204, Standard for Smoke and Heat Venting.

3-1.3.3 The means provided for the temperature activation of vents shall be located at or near the highest elevation of the ceiling.

3-1.3.4 Size and Spacing of Vents.

3-1.3.4.1 Effective venting area. The effective venting area of each vent shall not be less than 16 ft.<sup>2</sup> (1.5 m<sup>2</sup>) with no dimension less than 4 ft. (1.2 m), excluding ribs or gutters having a total width not exceeding 6 in. (152 mm).

3-1.3.4.2 Spacing. The maximum center-to-center spacing between vents within the building shall be 120 ft. (36.6 m).

3-1.3.4.3 Venting Ratios. The ratio of effective venting area of vent openings to floor areas shall be not less than 1:100.

3-1.3.5 Draft Curtains.

3-1.3.5.1 General. Draft curtains shall be provided to subdivide a vented building in accordance with the provisions of this section.

Exception: When approved by the authority having jurisdiction, draft curtains shall be permitted to be omitted in buildings protected throughout with an approved automatic sprinkler system designed in accordance with NFPA 13, Standard for installation of Sprinkler Systems.

3-1.3.5.2 Construction. Draft curtains shall be constructed of sheet metal, cement fiber board, lath and plaster, gypsum wallboard or other approved materials that provide equivalent performance to resist the passage of smoke. Draft curtain joints and connections shall be smoke tight.

3-1.3.5.3 Location and Depth. Draft curtains shall extend down from the roof or ceiling for a minimum depth of 6 ft. (1.8 m), but need not extend closer than 8 ft. (2.4 m) to the floor.

3-1.3.5.4 Spacing. The distance between draft curtains shall not exceed 250 ft. (76.2 m) and the curtained area shall be limited to 50,000 ft.<sup>2</sup> (4645 m<sup>2</sup>).

**SUBSTANTIATION:** Smoke and heat vents serve multiple functions in a building including property protection and fire fighter safety which are strongly supported by the NFPA Board of Directors who have stated that they are to be key considerations of the new NFPA 5000 Building Code. Smoke and heat vents also facilitate fire fighting operations.

Smoke and heat vents can help to minimize smoke and heat damage within the building in order to protect the building contents, as well as the building structure, by venting the smoke and hot gases directly to the exterior. They provide for fire fighter safety by minimizing or even eliminating the time required for fire fighters to be on the roof to ventilate the building in order to effectuate control and eventual extinguishment and overhaul of a fire. They also help to facilitate fire fighting operations by venting the smoke sufficiently so that the fire fighters can identify and reach the seat of the fire to more quickly effectuate extinguishment. This also contributes to fire fighter safety by providing adequate visibility for fire fighters to conduct their operations so that they do not become disoriented or lost and subsequently overcome by the smoke or hot gases generated by the fire.

Since very large area one story storage buildings and buildings containing high-piled or rack storage can pose a significant fire fighting challenge to the responding fire department, the installation of smoke and heat vents can prove very beneficial as indicated above for achieving property protection and fire fighter safety, as well as facilitating fire fighting operations. The requirements proposed in this item will provide an enhanced level of fire safety in such buildings. These requirements are also consistent with the 2001 Accumulative Supplement to the 2000 WFC Uniform Fire Code.

**COMMITTEE ACTION:** Reject

**COMMITTEE STATEMENT:** Lack of technical substantiation.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #10)

230-7-(3-3.5.1) : Accept

**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers

**RECOMMENDATION:** Remove the “\*” from this section, delete A-3-3.5.1 and add the following new section:

3-3.6 Security Service. Security service, where provided, shall comply with NFPA 601.

**SUBSTANTIATION:** Standard presently gives information on alarm service. Watchman service should also be included.

**COMMITTEE ACTION:** Accept

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #12)

230-8-(3-4.3) : Accept in Part

**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers

**RECOMMENDATION:** Revise text as follows:

3-4.3.1 Where possible, relocate all welding, cutting and other hot work from the storage area to a safe area.

3-4.3.2 ~~3-4.3.1~~ Where welding or cutting operations are necessary, the requirements of NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, shall apply. ~~Where possible, work shall be removed to a safe area.~~

3-4.3.3\* ~~3-4.3.2~~ Welding, soldering, brazing, and cutting shall be permitted to be performed on building components or contents that cannot be removed, provided no storage is located below and within 25 ft (7.6 m) of the working area and flameproof tarpaulins enclose this area. 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 and attended 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 minutes following completion of open-flame operation.

**SUBSTANTIATION:** Reorganized to require relocation first but if it can not be, follow NFPA 51B and these specific steps.

**COMMITTEE ACTION:** Accept in Part

Accept deletion of last sentence of Section 3-4.3.1 only.

**COMMITTEE STATEMENT:** “Where possible” is unenforceable language. See Committee Proposal 230-22 (Log #CP21).

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #CP23)

230-9-(3-4.8 (New)) : Accept

**SUBMITTER:** Technical Committee on General Storage,

**RECOMMENDATION:** Add a new Section 3-4.8 as follows:

3-4.8 Lighting. Metal halide lighting shall be selected, installed and maintained such that failure of the bulb shall not create a fire hazard.

**SUBSTANTIATION:** Failure of metal halide lighting has resulted in fires in storage occupancies.

**COMMITTEE ACTION:** Accept

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #15)

230-10-(5-2.2) : Accept

**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers

**RECOMMENDATION:** Revise text as follows:

Where ceiling sprinklers and in-rack sprinklers on racks are installed in accordance with Section 7-4 of NFPA 13, fire protection of steel building columns or vertical rack members that support the building shall not be required.

**SUBSTANTIATION:** Corrects typo, includes rack supported buildings and tracks with NFPA 13.

**COMMITTEE ACTION:** Accept

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

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(Log #2)

## COMMENT ON AFFIRMATIVE:

SCHUMANN: The reference to Section 7.4 of NFPA 13 will have to be updated due to the reorganization of NFPA 13 (May 2002 cycle).

(Log #1)

230-11-(5-2.3) : Reject

**SUBMITTER:** Northcentral Regional Fire Code Dev. Committee,

**RECOMMENDATION:** Revise to read:

5-2.3† For sprinklered buildings with rack storage of over 4.6 m (15 ft) in height and ceiling sprinklers only installed, the building structural steel components shall be protected by a minimum 1-hour fire resistance rating. Exception: Where the sprinkler installation meets the requirements of 7-9.8 of NFPA 13.

**SUBSTANTIATION:** The proposed wording better clarifies that the building structural steel components are to be protected.

**COMMITTEE ACTION:** Reject

**COMMITTEE STATEMENT:** Committee feels the proposed wording fails to clarify which building components are to be protected. See Committee Action on Proposal 230-12 (Log #16).

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #16)

230-12-(5-2.3) : Accept in Principle

**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers

**RECOMMENDATION:** Revise text as follows:

For sprinklered buildings with rack storage over 4.6 m (15 ft) in height and ceiling sprinklers only installed, steel building columns or vertical rack members that support the building structural steel components shall have a minimum 1-hour fire resistance rating.

Exception: Where the sprinkler installation meets the requirements of 7-9.8 of NFPA 13.

**SUBSTANTIATION:** Defines structural steel components and tracks with NFPA 13.

**COMMITTEE ACTION:** Accept in Principle

Replace Section 5-2.3 text with the following:

"For sprinklered buildings with rack storage over 4.6 m (15 ft) in height and ceiling sprinklers only installed, steel building columns within the rack structure or vertical rack members that support the building shall have a minimum 1-hour fire resistance rating or the sprinkler installation shall meet the requirements of Section 7-9.8 of NFPA 13."

**COMMITTEE STATEMENT:** Wording changed from that proposed to clarify the building columns which require protection and to coincide with NFPA 13 requirements.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

**COMMENT ON AFFIRMATIVE:**

SCHUMANN: The reference to 7.9.8 of NFPA 13 will have to be updated due to the reorganization of NFPA 13 (May 2002 cycle).

(Log #14)

230-13-(5-3.3.2) : Reject

**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers

**RECOMMENDATION:** Revise text as follows:

This standard contemplates aisle widths maintained either by fixed rack structures or control in placement of portable racks. Any decrease in aisle width or storage in the aisle, shall require a review of the adequacy of the protection system.

**SUBSTANTIATION:** Protection of rack storage with spray sprinklers is based on there being aisles to prevent the spread of fire from rack to rack. Placing storage in the aisles allows such spread and overtax the sprinkler system design.

**COMMITTEE ACTION:** Reject

**COMMITTEE STATEMENT:** Storage in aisles is addressed in Section 3-2.3.2.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-14-(6-1.1.1 (New)) : Accept in Principle

**SUBMITTER:** Southern Regional Fire Code Dev. Committee,

**RECOMMENDATION:** Add a new 6-1.1.1 to read:

6-1.1.1 This chapter shall not apply to:

1. The storage of less than 50 passenger tires.

2. The storage of scrap tires. (see Chapter 11)

Add a new item (g) to 1-1.2 to read:

(g) The storage of less than 50 passenger tires.

**SUBSTANTIATION:** As currently worded the standard requires small repair garages with a small amount of tires to meet this standard. The existing requirement is overly restrictive.

**COMMITTEE ACTION:** Accept in Principle

Add item (g) to Section 1-1.2:

(g) miscellaneous tire storage.

Move the Exception of Section 6-1.1 into a new Section 6-1.1.1 to read as follows:

6-1.1.1 This chapter shall not apply to scrap tire storage (see Chapter 11).

Move A-1-4.1 Miscellaneous Tire Storage to a new Section A-1-1.2(g).

**COMMITTEE STATEMENT:** The committee agrees in principle with the proposed changes but that the limitation should be within the existing definition for miscellaneous tire storage. Moved Annex information for further clarification.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28

**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 20

NEGATIVE: 1

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

**EXPLANATION OF NEGATIVE:**

SCHUMANN: To state that NFPA 230 does not apply to Miscellaneous Tire Storage and therefore does not need sprinkler protection in incorrect. Add 6.1.1.2. This chapter shall not apply to Miscellaneous Tire Storage but such storage must be protected per 3.3.1. Do not relocate the text of A.1.4.1 from 1.4.1 Miscellaneous Tire Storage to 1.1.2(g). The text of A.1.4.1 Miscellaneous Tire Storage provides additional reference information on the definition and not on why NFPA 230 does not apply.

(Log #18)

230-15-(Chapter 9 (New)) : Accept in Principle

**SUBMITTER:** Anthony C. Apfelbeck, City of Altamonte Springs Fire Department

**RECOMMENDATION:** Add new chapter to read as follows:

Chapter X Guidelines-Provisions for Storage of Forest Products

X-1 General.

X-1.1 Purpose. The intent of these guidelines-provisions is to provide minimum fire protection standards-guidance to minimize the fire hazard in areas used for the storage of forest products, particularly as they are stored outside buildings. ~~These guidelines are not intended to be mandatory requirements. Each individual property will have its own special conditions of stock handling, exposure, and topography. For this reason, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved. The authority having jurisdiction should be consulted in all cases.~~

A-X-1.1 Each individual property will have its own special conditions of stock handling, exposure, and topography. For this reason, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved. The authority having jurisdiction should be consulted.

X-1.2 Scope.

These guidelines-provisions shall cover the following:

(1) Retail and wholesale lumber storage yards  
(2) Outside storage of lumber and timber at other than retail or wholesale yards

(3) Outside storage of ties, poles, piles, posts, and other similar forest products at pressure-treating plant yards

(4) Outside storage of wood chips

(5) Outside storage of logs

(6) Outside storage of hogged material

X-2 Retail and Wholesale Lumber Storage Yards.

X-2.1 Application.

X-2.1.1 The intent of the guidelines-provisions contained in this section is to provide minimum fire protection guidance-standards to minimize the fire hazard in the following areas:

(1) Retail lumberyards handling forest products and other building materials

(2) Wholesale lumber storage yards including distribution, holding, and transshipment areas

(3) Buildings in retail and wholesale lumberyards used for storage of forest products or auxiliary operations

X-2.1.2 In addition to the guidelines-provisions contained in Section X-2, the provisions outlined in Section X-7 ~~should~~ shall apply to all retail and wholesale lumber storage yards, except as modified herein.

X-2.1.3 The type of operations at properties where these recommendations apply will vary widely. Retail lumber and building material operations are often characterized by large area buildings with minor outside storage areas. On the other hand, wholesale and distribution yards can involve large outside storage areas that present fire protection problems similar to mill yards. The principles provisions outlined in Section X-3 should ~~shall~~ be used as a further guide for large outside wholesale and distribution yards, storage areas, and the authority having jurisdiction should be consulted in all cases.

~~A-X-2.1.4 the type of operations at properties where these provisions apply will vary widely. Retail lumber and building material operations are often characterized by large area buildings with minor outside storage areas. On the other hand, wholesale and distribution yards can involve large outside storage areas that present fire protection problems similar to mill yards.~~

X-2.2 General.

X-2.2.1 Fire loss experience in lumberyards indicates that large undivided stacks, congested storage conditions, delayed fire detection, inadequate fire protection, and ineffective fire fighting tactics are the principal factors that allow lumberyard fires to reach serious proportions. The fire hazard potential inherent in lumber storage operations with large quantities of combustible hazard potential inherent in lumber storage operations with large quantities of combustible material can best be controlled by a positive fire prevention program under the direct supervision of top upper level management, and should ~~This program shall~~ include the following:

(1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based upon sound ~~proven~~ fire prevention and protection principles

(2) Facilities for early fire detection, transmission of alarm and fire extinguishment (see NFPA 72, National Fire Alarm Code).

(3) Fire lanes, as defined in NFPA 1, Uniform Fire Prevention Code, to separate large stacks and provide access for effective fire-fighting operations

(4) Separation of yard storage from yard buildings and other exposing properties

(5) An effective fire prevention maintenance program, including regular yard inspections by trained personnel.

~~A-X-2.2.1 Fire loss experience in lumberyards indicates that large undivided stacks, congested storage conditions, delayed fire detection, inadequate fire protection, and ineffective fire-fighting tactics are the principal factors that allow lumberyard fires to reach serious proportions.~~

X-2.2.2 Cargo yards with lumber stored on piers or wharves and lumber stored on raised platforms present special problems of construction and protection: ~~shall be in accordance with NFPA 307, Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves; and the authority having jurisdiction should be consulted in each case.~~

X-2.2.3 ~~Water supplies shall be provided in accordance with NFPA 1, Uniform Fire Prevention Code. It is recognized that retail and wholesale lumber storage yards are normally located within municipal boundaries where there are municipal water supplies available for fire protection. For basic fire protection, the municipal system should be capable of supplying at least four 2 1/2-in. (63.5 mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum]. Where large scale fire fighting operations can be expected, larger water supplies are needed. Where protection from municipal water supplies and hydrant systems is not present or is not considered adequate by the authority having jurisdiction, a yard fire hydrant system should be provided.~~

~~A-X-2.2.3 It is recognized that retail and wholesale lumber storage yards are normally located within municipal system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum]. Where large-scale fire-fighting operations can be expected, larger water supplies are needed. Where protection from municipal water supplies and hydrant systems is not present or is not considered adequate by the authority having jurisdiction, a yard fire hydrant system should be provided and installed in accordance with NFPA 24, Private Fire Service Mains and Their Apertances.~~

X-2.3 Open Yard Storage.

X-2.3.1 Lumber stacks should ~~shall~~ be on solid ~~stable~~ ground, preferably paved or surfaced with materials such as cinders, fine gravel, or stone.

Where the danger of underground fire is present, refuse- or sawdust-filled land should ~~shall~~ not be used.

X-2.3.2 The method of stacking should ~~shall~~ be solid wherever possible and in an orderly and regular manner.

X-2.3.3 It is recognized that some materials will be stored on pallets in an open yard. As stacks of empty pallets present a severe fire problem, empty pallets should ~~shall~~ be stored in accordance with the guidelines provisions set out in Table X-2.3.3(a) and Table X-2.3.3(b).

~~A-X-2.3.3 It is recognized that some materials will be stored on pallets in an open yard. As stacks of empty pallets present a severe fire problem, special attention needs to be paid to the storage arrangements of empty pallets.~~

X-2.3.4 The height of stacks should ~~shall~~ not exceed 20 ft (6.1 m) with due regard for stability.

Air drying stickered stacks are subject to rapid fire spread through the air spaces and should therefore be kept as low as practicable:

~~A-X-2.3.4 Air-drying stickered stacks are subject to rapid fire spread through the air spaces and should therefore be kept as low as practicable.~~

X-2.3.5 Where stacks are supported clear of the ground, adequate 6 in. (15.24 cm) of clearance should ~~shall~~ be provided for cleaning operations under the stacks.

X-2.3.6 Driveways should ~~shall~~ be so spaced that a maximum grid system of not over 50 ft X 150 ft (15.2 m X 45.7 m) is produced.

X-2.3.7 Driveways should ~~shall~~ have a minimum width of 15 ft (4.6 m) and an all-weather surface capable of supporting fire department apparatus. The radius of turns should be designed to accommodate fire department apparatus.

X-2.3.8 Where the yard has earth or crushed stone drives, boundary posts with signs designating stacking limits should ~~shall~~ be provided to indicate yard area and alley limits. In paved yard areas, painted boundary limits can be used instead of posts and signs.

X-2.4 Buildings.

X-2.4.1 Automatic sprinklers provide an efficient means of fire detection and extinguishment. Automatic sprinkler protection should be considered for all large storage buildings containing combustible contents and auxiliary buildings containing hazardous operations that can constitute an exposure to outside lumber storage or other property. Automatic sprinkler protection for buildings used for indoor storage of forest products should ~~shall~~ be designed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems.

~~A-X-2.4.1 Automatic sprinklers provide an efficient means of fire detection and extinguishment. Automatic sprinkler protection should be considered for all large storage buildings containing combustible contents and auxiliary buildings containing hazardous operations that can constitute an exposure to outside lumber storage or other property.~~

X-2.4.2 Where automatic sprinklers are not installed, large storage buildings should ~~shall~~ be subdivided by fire walls or fire barrier walls in accordance with NFPA 221, Fire Walls and Fire Barrier Walls, into compartments not exceeding area limits specified in generally accepted model buildings codes.

X-2.5 Exposure Protection.

X-2.5.1 ~~Many retail lumberyards sell clay, concrete, and stone products. These and other lesser burnable materials (large-size timbers and flat-stacked stock) should shall be stored or stacked on the perimeter of the yard to act as a barrier between the yard and adjacent properties or buildings.~~

~~A-X-2.5.1 Many retail lumberyards sell clay, concrete, and stone products. If present, these products shall be arranged to create a fire barrier between the yard and adjacent properties or buildings.~~

X-2.5.2 Exposure to the Yard.

X-2.5.2.1 Except as noted in X-2.5.2.2; and X-2.3.3 open yard stacking should ~~shall~~ be located with as least 15 ft (4.6 m) much clear space to buildings as practicable. Building walls should ~~shall~~ have sufficient fire resistance capability to contain a fire that originates in the building, and windows or other openings should ~~shall~~ be reduced in size or adequately blocked to prevent radiant heat exposure to the open yard stacking. (See X-7.3.1.)

~~A-X-2.5.2.1 Sufficient fire resistance capability shall be determined through compliance with NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.~~

X-2.5.2.2 Unsprinklered buildings containing hazardous manufacturing or other operations (e.g., woodworking, glazing, painting, dry kilns, auto repairing, grain or feed milling or grinding, aboveground fuel or gasoline tanks) should ~~shall~~ have at least 50 ft (15.2 m) of clear space to the nearest lumber stack, shed, or warehouse. Boundary posts with signs designating stacking limits should ~~shall~~ be provided to designate the clear space to the aforementioned buildings, tanks, and so forth.

X-2.5.3 Exposure for the Yard. Because of the large quantities of material generally involved in lumberyard fires, some form of exposure protection for adjoining properties is recommended. Clear spaces or walls capable of providing fire barriers between yard storage and the exposed properties are desirable. The responsibility for the proper protection of properties adjoining a lumberyard is often a joint one to be worked out by the cooperation of the lumberyard and adjoining property owners. Refer in each case to the authority having jurisdiction. Open yard stacking shall be located with at least 15 ft (4.6 m) clear space to adjacent property lines. Alternative forms of exposure protection shall be permitted to be approved by the Authority Having Jurisdiction.

~~A-X-2.5.3 Because of the large quantities of material generally involved in lumberyard fires, some form of exposure protection for adjoining properties is recommended. Clear spaces or walls capable of providing fire barriers between yard storage and the exposed properties are desirable. The responsibility for the proper protection of properties adjoining a lumberyard is often a joint one to be worked out by the cooperation of the lumberyard and adjoining property owners. Refer to the authority having jurisdiction.~~

X-2.6 Special Fire Prevention.

X-2.6.1 All non-portable power woodworking machines, except for portable units, should ~~shall~~ be equipped with refuse removal equipment conforming to NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids.

# NFPA 230 — November 2002 ROP

**Table X-2.3.3(a) Guidelines for Required Clearance Between Outside Idle Pallet Storage and Building**  
**Minimum Distance of Wall from Storage of**

Wall Construction	Openings	Under 50 Pallets		Under 50 Pallets		Over 200 Pallets	
		ft	m	ft	m	ft	m
Masonry	None	0	0	0	0	015	04.6
Wired glass with outside sprinklers and 1-hour doors		0	0	10	3.0	20	6.1
Wired or plain glass with outside sprinklers and 3/4-hour doors		10	3.0	20	6.1	30	9.1
Wood or metal with outside sprinklers		10	3.0	20	6.1	30	9.1
Wood, metal, or other		20	6.1	30	9.1	50	15.2

**Notes:**

1. Fire resistive protection comparable to that of the wall should also be provided for combustible eave lines, vent openings, and so forth.
2. Where pallets are stored close to a building, the height of storage should be restricted to prevent burning pallets from falling on the building.
3. Manual outside open sprinklers generally are not a reliable means of protection unless property is attended to at all times by plant emergency personnel.
4. Open sprinklers controlled by a deluge valve are preferred.

**Table X-2.3.3(b) Guidelines for Required Clearance Between Outdoor Pallet Storage and Other Yard Storage**

Pallet Size	Minimum Distance	
	ft	m
Under 50 pallets	20	6
50-200 pallets	30	9.1
Over 200 pallets	50	15.2

X-2.6.2 Materials such as hay, coal, grain, and feed should ~~shall~~ stored in separate buildings or in the open with adequate 10 ft (3.05 m) clear space between yard buildings or open yard storage.

X-3 Outside Storage of Lumber at Other than retail or Wholesale Yards.

X-3.1 Application.

X-3.1.1 The intent of the guidelines provisions contained in this section is to provide minimum fire protection standards guidance to minimize the fire hazard in large yard storage areas containing lumber, timber, and other similar wood products not intended for retail or wholesale distribution at the site. Each individual property will have its own special conditions of yard use, material handling methods, and topography. For this reason, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved.

A-X-3.1.1. Each individual property will have its own special conditions of yard use, material handling methods and topography. For this reason, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved. The authority having jurisdiction should be consulted.

X-3.1.2 In addition to the guidelines provisions contained in this section, appendix; the provisions outlined in Section X-7 should ~~shall~~ apply to all large yard storage areas for lumber and timber at other than retail or wholesale yards, ~~except as modified herein.~~

X-3.2 General.

X-3.2.1 Fire loss experience in lumber storage yards indicates that large undivided stacks, congested storage conditions delayed fire detection, inadequate fire protection, and ineffective fire-fighting tactics are the principal factors that allow lumberyard fires to reach serious proportions. The fire hazard potential inherent in lumber storage operations with large quantities of combustible material can best be controlled by a positive fire prevention program under the direct supervision of top upperlevel management and ~~should shall~~ include the following:

- (1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based on sound fire prevention and protection principles
- (2) Facilities for early fire detection, transmission of alarm, and fire extinguishment (see NFPA 72, National Fire Alarm Code)
- (3) Fire lanes to separate large stacks and provide access for effective fire-fighting operations
- (4) Separation of yard storage from mill operations and other exposing properties
- (5) An effective fire prevention maintenance program, including regular yard inspections by trained personnel

A-X-3.2.1 Fire loss experience in lumber storage yards indicates that large undivided stacks, congested storage conditions, delayed fire detection, inadequate fire protection, and ineffective fire-fighting tactics are the principle factors that allow lumberyard fires to reach serious proportions.

X-3.2.2 Cargo yards with lumber stored on piers or wharves and lumber stored on raised platforms present special problems of construction and protection. NFPA 307, Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves, and the authority having jurisdiction should ~~shall~~ be consulted in each case.

X-3.3 Basic Lumberyard Protection.

X-3.3.1 For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

~~Where large-scale fire-fighting operations can be expected, larger water supplies with adequate mains are needed. (See X-3.4.)~~

~~For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached so as to permit rapid hose laying to all parts of the stacking areas. For this reason, the hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61.0 m) of hose. Hydrants preferably should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61.0 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 13, Standard for the Installation of sprinkler Systems.) Water supplies shall be provided in accordance with NFPA 1, Uniform Fire Prevention Code.~~

A-X-3.3.1 For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

~~Where large-scale fire-fighting operations can be expected, larger water supplies with adequate mains are needed.~~

~~For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached so as to permit rapid hose laying to all parts of the stacking areas. For this reason, the hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61.0 m) of hose. Hydrants preferably should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61.0 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 13, Standard for the Installation of Sprinkler Systems.)~~

X-3.3.2 Access to the plant and yard from public highways should ~~shall~~ be provided by all-weather roadways capable of supporting fire department apparatus.

X-3.3.3 The storage site should ~~shall~~ be reasonably level, solid ground, preferably paved or surfaced with material such as cinders, fine gravel, or stone. Refuse- or sawdust-filled land, swampy ground, or areas where the hazard of underground fire is present should ~~shall~~ not be used.

X-3.3.4 Stack height shall be limited to 20 ft (6.1 m).

X-3.4 Special Lumberyard Protection:

~~X-3.4.1 Yards consisting of single carrier loads of green flat-stacked lumber present a minimum hazard that generally requires only the basic protection provisions of X-3.3 for effective fire control. High stacks of lumber stickered for air drying present a severe hazard that will require effective use of large stream equipment and greatly expanded water supplies for fire control. In yards requiring more than the basic protection provisions of X-3.3 for effective fire control, the following provisions are suggested as a guide. The relative importance of these provisions and the degree to~~

which they might be needed will vary with yard conditions, and the authority having jurisdiction should be consulted in all cases.

X-3.4.2 Powerful water supplies and large mains should be provided where adequate public or private fire department services are available. Large stream equipment, such as portable turrets and deluge sets, requires 750 gpm to 1000 gpm (47 L/sec to 63 L/sec) for each appliance. Monitor towers can require supplies in excess of 1000 gpm (63 L/sec) for each unit. In large yards where the hazard is severe, many of these devices could need to be operated simultaneously.

X-3.4.3 fire lanes suitable for fire department operations should be provided with storage arranged so that no part of the occupied area is more than 50 ft (15.2 m) in any direction from access by motorized fire-fighting equipment. Where special extinguishing equipment, such as portable turrets, deluge sets, and monitor towers is available, access distances can be governed by their effective reach with available water supplies. fire lanes should be kept unobstructed, have an all-weather surface sufficiently strong to support fire apparatus, and should be of sufficient width to permit maneuvering of motorized fire apparatus.

X-3.4.4 Stack heights should be limited. Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations. Air drying stickered stacks are subject to a more rapid fire involvement and should be kept as low as possible.

X-4 Outside Storage of Ties, Poles, Piles, Posts, and Other Similar Forest Products at Pressure-Treating Plant Yards.

X-4.1 Application.

X-4.1.1 The intent of the guidelines provisions contained in this section is to provide minimum fire protection guidance standards to minimize the fire hazard in yard storage areas containing treated and untreated ties, poles, piles, posts, and other similar forest products in yards connected with pressure-treating plants, but not including the treating buildings, processes, or storage of treating materials. Each individual property will have its own special conditions of yard use, stock handling methods, and topography. For this reason, only basic fire protection principles are suggested herein, which are intended to be applied with due consideration of all local factors involved.

A-X-4.1.1 Each individual property will have its own special conditions of yard use, stock handling methods, and topography. For this reason, only basic fire protection principles are suggested herein, which are intended to be applied with due consideration of all local factors involved. Ties, as used herein, includes ties, poles, piles, posts, and other similar forest products. Treated ties are those pressure impregnated with preservatives.

X-4.1.2 Ties, as used herein, includes ties, poles, piles, posts, and other similar forest products. Treated ties are those pressure impregnated with preservatives.

X-4.1.3 In addition to the guidelines provisions contained in this section, the provisions outlined in Section X-7 should apply to all outside storage of ties, poles, piles, posts, and other similar forest products at pressure-treating plant yards, except as modified herein.

X-4.2 General. Fire loss experience in tie storage yards indicates that large undivided stacks, congested storage conditions, delayed fire detection, inadequate fire protection, and ineffective fire-fighting tactics are the principal factors that allow fires to reach serious proportions. The fire hazard potential inherent in tie storage operations with large quantities of combustible material can best be controlled by a positive fire prevention program under the direct supervision of top upper level management, and should This program shall include the following:

(1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based upon sound fire prevention and protection principles

(2) Facilities for early fire detection, transmission of alarm, and fire extinguishment (see NFPA 72, National Fire Alarm Code);

(3) Fire lanes to separate large stacks and provide access for effective fire-fighting operations

(4) Separation of yard storage from mill buildings and other exposing properties

(5) An effective fire prevention maintenance program, including regular yard inspections by trained personnel

A-X-4.2 Fire loss experience in tie storage yards indicates that large undivided stacks, congested storage conditions, delayed fire detection, inadequate fire protection, and ineffective fire-fighting tactics are the principle factors that allow fires to reach serious proportions.

X-4.3 Basic Tie Yard Protection.

X-4.3.1 Unobstructed alleyways of sufficient width for hand or cart fire hose laying operations should shall be provided between piles. A minimum alleyway width of 4 ft (1.2 m) should shall be provided. Alleyways should shall be spaced so that initial fire-fighting operations can be effective. With relatively open stacking (i.e., stacking that will permit penetration of fire-extinguishing streams) This can usually be accomplished by providing a 4 ft (1.2-m) or greater alleyway width between alternate rows of tie stacks [see Figure X-4.3.1(a)]. Flat crib style stacking without space between stacks that forms solid packed rows would require a 4-ft (1.2-m) or greater alleyway width between each such row, the length of the rows (distance between fire lanes) should shall be held to 75 ft (22.9 m) or less. In no event should shall such alleyways be reduced to less than 2 ft (0.6 m) in width [see Figure X-4.3.1(b)].

Figure X-4.3.1(a) Relatively open stacking methods.

Figure X-4.3.1(b) Crib style stacking into solid rows.

A-X-4.3.1 With relatively open stacking (i.e., stacking that will permit penetration of fire-extinguishing streams) this can usually be accomplished by providing a 4-ft (1.2-m) or greater alleyway width between alternate rows of tie stacks [see Figure X-4.3.1(a)]. Flat crib-style stacking without space between stacks that forms solid packed rows would require a 4-ft (1.2-m) or greater alleyway width between each row. Where the stacking area does not permit a 4-ft (1.2-m) or wider alleyway between each such row, the length of the rows (distance between fire lanes) should be held to 75 ft (22.9 m) or less. In no event should such alleyways be reduced to less than 2 ft (0.6 m) in width [see Figure X-4.3.1(b)].

Figure X-4.3.1(a) Relatively open stacking methods.

Figure X-4.3.1(b) Crib style stacking into solid rows.

X-4.3.2 For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

Where large scale fire fighting operations can be expected, larger water supplies with adequate mains are needed. (See X-4.4)

For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached so as to permit rapid hose laying to all parts of the stacking part of the yard can be reached with 200 ft (61 m) of hose. Hydrants preferably should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 13, Standard for the Installation of Sprinkler Systems.) Water supplies shall be provided in accordance with NFPA 1, Uniform Fire Prevention Code.

A-X-4.3.2 For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

Where large scale fire fighting operations can be expected, larger water supplies with adequate mains are needed. (See X-4.4.)

For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached so as to permit rapid hose laying to all parts of the stacking areas. For this reason, hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61 m) of hose. Hydrants preferably should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 13, Standard for the Installation of Sprinkler Systems.)

X-4.3.3 Access to the plant and yard from public highways should shall be provided by all-weather roadways capable of supporting fire department apparatus.

X-4.3.4 The storage site should shall be reasonably level, solid ground, preferably paved or surfaced with material such as cinders, fine gravel, or stone. Refuse- or sawdust-filled land, swampy ground, or areas where the hazard of underground fire is present should shall not be used.

X-4.3.5 Stack heights shall be limited to 20 ft (6.1 m).

A-X-4.3.5 Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations.

X-4.4 Special Tie Yard Protection.

X-4.4.1 Tie yards containing low stacked storage, small amounts of treated ties, and well-separated treating facilities present minimum hazards that generally require only the basic protection provisions of X-4.3 for effective fire control. High stacking over extensive areas, congested storage, and large amounts of treated tie storage present increased hazards that require additional safeguards and protection facilities. In yards requiring more than the basic protection provisions of X-4.3 for effective fire control, the following provisions are suggested as a guide. The relative importance of these provisions and the degree to which they might be needed will vary with yard conditions, and the authority having jurisdiction should be consulted in all cases.

X-4.4.2 Powerful water supplies and large mains should be provided where public or private fire department services are available. Large stream equipment, such as portable turrets and deluge sets, requires 750 gpm to 1000 gpm (47 L/sec to 63 L/sec) for each appliance. Monitor towers can require supplies in excess of 1000 gpm (63 L/sec) for each unit. In large yards where the hazard is severe, many of these devices could need to be operated simultaneously.

X-4.4.3 fire lanes suitable for fire department operations should shall be provided with storage arranged so that no part of the occupied area is more than 50 ft (15.2 m) in any direction from access by motorized fire fighting equipment. Where special extinguishing equipment, such as portable turrets, deluge sets, and monitor towers, is available, access distances can be governed by their effective reach with available water supplies. Fire lanes should be kept unobstructed, have an all-weather surface sufficiently strong to support fire apparatus, and should be of sufficient width to permit maneuvering of motorized fire apparatus.

X-4.4.4. Stack heights should be limited. Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations.

X-4.4.5 Treated ties should not be intermixed with untreated products. A 100-ft (30.5-m) clear space should be maintained between treated tie storage and untreated storage.

## NFPA 230 — November 2002 ROP

### X-5 Outside Storage of Wood Chips and Hogged Material.

#### X-5.1 Application.

X-5.1.1 The intent of the guidelines provisions contained in this section is to provide minimum fire protection guidance standards to minimize the fire hazard in yard storage areas containing wood chips and hogged material. Each individual property will have its own special conditions of yard use, handling methods, and topography. It is recognized that climate conditions, wood species, and the age of piles are all factors affecting fire safety. For these reasons, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved.

A-X-5.1.1 Each individual property will have its own special conditions of yard use, handling methods, and topography. It is recognized that climate conditions, wood species, and the age of piles are all factors affecting fire safety. For these reasons, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved. Except for the surface layer, the moisture content of a pile of wood chips or hogged material is quite high, so surface fires will not generally penetrate more than a few inches into the pile. Fire tests indicate that for areas of average humidity conditions, the flame propagation over the surface is relatively slow. These conditions permit ready extinguishment, provided that there is early detection and good access. It is expected that in areas where long periods of low humidity prevail, faster surface flame spread can be anticipated, increasing the importance of early detection and good access.

X-5.1.2 Except for the surface layer, the moisture content of a pile of wood chips or hogged material is quite high, so surface fires will not generally penetrate more than a few inches into the pile. Fire tests indicate that for areas of average humidity conditions, the flame propagation over the surface is relatively slow. These conditions permit ready extinguishment, provided that there is early detection and good access. It is expected that in areas where long periods of low humidity prevail, faster surface flame spread can be anticipated, increasing the importance of early detection and good access.

X-5.1.32 In addition to the guidelines provisions contained in this section, the provisions outlined in Section X-7 should shall apply to all outside storage of wood chips and hogged material, except as modified herein.

#### X-5.2 General.

X-5.2.1 Fire experience and fire tests indicate that two completely different types of fires can occur in storage piles—surface fires and internal fires. Fire prevention activities and fire protection facilities should, therefore, be prepared to cope with both situations. The fire hazard potential inherent in storage piles can best be controlled by a positive fire prevention program under the direct supervision of upper level management. These programs should be under the direct supervision of top management and should shall include the following:

- (1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based upon sound fire prevention and protection principles
- (2) Establishing control over the various factors that lead to spontaneous heating, including provisions for monitoring the internal condition of the pile
- (3) Facilities for early fire detection and extinguishments, (see NFPA 72, National Fire Alarm Code)
- (4) Fire lanes around the piles and access roads to the top of the piles for effective fire-fighting operations
- (5) Facilities for calling the public fire department and facilities needed by them for fire extinguishment
- (6) An effective fire prevention maintenance program, including regular yard inspections by trained personnel

A-X-5.2.1 Fire experience and fire tests indicate that two completely different types of fires can occur in storage piles – surface fires and internal fires. Fire prevention activities and fire protection facilities should, therefore, be prepared to cope with both situations. Internal heating is a hazard inherent to long-term bulk storage of chips and hogged material that will progress to spontaneous combustion under certain pile conditions. Internal fires are difficult to detect and extinguish. Unless provisions are made for measuring internal temperatures, such fires can burn for long periods before emission of smoke at the surface indicates an internal fire. Extinguishment then becomes a lengthy and expensive loss-control and operating problem requiring equipment and manpower to move large portions of the pile, either by digging out the burning portions or removing the unburned portions of the pile. Experience has shown that these conditions create very large losses and special attention should be given to the prevention of spontaneous combustion and to pre-fire planning as how best to handle an imminent or actual fire in a particular pile.

X-5.2.2 Internal heating is a hazard inherent to long-term bulk storage of chips and hogged material that will progress to spontaneous combustion under certain pile conditions. Internal fires are difficult to detect and extinguish. Unless provisions are made for measuring internal temperatures, such fires can burn for long periods before emission of smoke at the surface indicates an internal fire. Extinguishment then becomes a lengthy and expensive loss-control and operating problem requiring equipment and manpower to move large portions of the pile. Experience has shown that these conditions create very large losses and special attention shall be given to the prevention of spontaneous combustion and to pre-fire planning as how best to handle an imminent or actual fire in a particular pile.

X-5.2.3.2 Prevention of internal fires requires an understanding of the factors that cause exothermic oxidation so that steps can be taken to minimize this hazard and to provide means of monitoring temperature conditions inside the pile. The following are some of the important items that should shall be considered when establishing operating procedures:

(a) All refuse and old chips should shall be avoided in the chip pile base.

(b) The storage site should shall be reasonably level, solid ground, or should shall be paved with blacktop, concrete, or other hard-surface material that has been thoroughly cleaned before starting a new pile.

(c) Operating plans for the buildup and reclaiming of the pile should shall be based upon a maximum turnover time of 1 year under ideal conditions. Piles containing other than screened chips made from cleaned and barked logs (e.g., whole-tree chip piles containing bark, leaves, and other extraneous or hogged material) can be subject to greater degrees of spontaneous heating and thermal degradation and should shall be reclaimed more frequently.

(d) The pile size should shall be limited. Fundamentally, several small piles are better than one large pile. Pile heights should shall be kept low, particularly for piles that inherently carry a larger percentage of fines and are subject to greater compaction. For example, veneer chip piles should shall be limited to 50 ft (15.2 m) in height.

(e) Thermocouples should shall be installed during pile buildup, or other means for measuring temperatures within the pile should shall be provided with regular (normally weekly) reports to management.

(f) The quality of chip supplies should shall be controlled in terms of percentage of fines.

(g) The concentration of fines should shall be avoided during pile buildup. Pneumatic systems produce an air classification of stored materials that should shall be recognized, and appropriate steps should shall be taken to minimize concentration of fines. It is preferable to spread new stored materials in a relatively even layer over the pile.

(h) The pile should shall be wetted regularly to help keep fines from drying out and help maintain the moisture content of the surface layer of the pile. It is important to minimize the diffusion of water from wet, stored material into dry fires to reduce exothermic heating caused by sorption effects. It is also important to maintain surface moisture content so as to reduce the hazard of surface fires during periods of hot, dry weather.

(i) Vehicles used on all piles should shall be of a type that minimizes compaction.

A-X-5.2.2. Prevention of internal fires requires an understanding of the factors that cause exothermic oxidation so that steps can be taken to minimize this hazard and to provide means of monitoring temperature conditions inside the pile.

#### X-5.3 Pile Protection.

X-5.3.1 Piles should shall be constructed with an access roadway to the top of the pile in order to reach any part of the pile. For very large piles, two or more access roadways should shall be provided on opposite sides of the pile. This recommendation applies only to storage in excess of 30 days.

X-5.3.2 Narrow, low piles facilitate fire extinguishment; therefore, piles should shall not exceed 60 ft (18.3 m) in height, 300 ft (91.4 m) in width, and 500 ft (152.4 m) in length. Where pile height and width are such that all portions of the pile cannot be reached by direct hose streams from the ground, arrangements should shall be made to provide fire-fighting service in these areas, and small fire stream supplies should shall be available on the top of the pile for handling small surface fires and for wetting the pile in dry weather. When piles exceed 500 ft (152.4 m) in length, they should shall be subdivided by fire lanes having at least 30 ft (9.1 m) of clear space at the base of the piles. Low barrier walls around piles should shall be provided to clearly define pile perimeters, prevent creeping, and facilitate cleanup of fire lanes.

X-5.3.3 Where suitable, a small, motorized vehicle amply equipped with portable extinguishing equipment or a water tank and pump should shall be provided. Lightweight ladders that can be placed against the side of the pile should shall be placed at convenient locations throughout the yard for use by the plant emergency organization. Training of the plant emergency organization should shall also include procedures and precautions to be observed by yard crews employing power equipment in fighting internal fires. (See X-7.4.6.)

X-5.3.4 Due to the size and configuration of piles, it is not practical to provide portable fire extinguishers within 75 ft (22.9 m) of travel distance to any point. At a minimum, however, portable fire extinguishers suitable for Class A fires should shall be provided in accordance with NFPA 10, Standard for Portable Fire Extinguishers, on all vehicles operating on the pile, in addition to the normal Class B units for the vehicle. Where hydrant hose houses are provided, a Class A extinguisher of at least a 2-A rating should be provided. (See NFPA 10, Standard for Portable Fire Extinguishers.)

A-X-5.3.4 Due to the size and configuration of piles, it is not practical to provide portable fire extinguishers within 75 ft (22.9 m) of travel distance to any point.

X-5.3.5 Fire hydrants connected to yard mains should be provided so that any part of the pile(s) can be reached by hose equipment provided in each hydrant hose house. Each hydrant hose house should be equipped with a complement of 2 1/2-in. (63.5 mm) and 1 1/2-in. (38.1 mm) hose, a 2 1/2-in. 1 1/2-in. (63.5 mm 38.1 mm) gated wye, and 1 1/2-in. (38.1 mm) combination nozzles.



Hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61 m) of hose.

Where pile configurations are such that all parts of the pile cannot be reached by the hose, a fire hose cart(s) equipped with an ample supply of hose and nozzles should be strategically placed in the storage area. Water supplies shall be provided in accordance with NFPA 1, Uniform Fire Prevention Code.

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Where pile configurations are such that all parts of the pile cannot be reached by the hose, a fire hose cart(s) equipped with an ample supply of hose and nozzles should be strategically placed in the storage area. The amount of water needed to control a pile fire will vary substantially depending upon the size of the pile. Weather conditions, operating methods, geographic location, the type of material stored, and the degree to which wetting can be employed affect the potential for a large area surface fire. Experience indicates that exposure to long periods of hot, dry weather with no regular surface wetting creates conditions under which fast-spreading surface fires, which require many hose streams for control depending on the size of the pile, can occur. Likewise, the frequency of pile turnover and operating methods affect the potential for serious internal fires. Piles built using methods that allow a concentration of fines and piles stored for long periods of time with no turnover are subject to internal heating that, if undetected, can create intense internal fires.

A minimum flow of 500 gpm (31.5 L/sec) should be provided at any fire hydrant in the pile area.

Additional flows should be provided as needed where conditions are likely to produce serious surface fires or large internal fires. Fire mains should be engineered to deliver the recommended gallonage plus allowance for operational uses and special extinguishing equipment at a residual pressure of 60 psi to 100 psi (413.7 kPa to 689.5 kPa) at the hydrants.

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X-5.3.7 Standard automatic sprinkler protection should shall be provided in all tunnels and enclosures under the pile. All other handling and conveyor installations of combustible construction, or elevated ones of noncombustible construction that are hood-enclosed, should shall also be provided with automatic sprinkler protection. Automatic sprinklers are needed in the above areas due to the difficulty of hand fire fighting in concealed, enclosed, or elevated areas. All motor and switch gear enclosures should be provided with approved, suitable portable fire extinguishers. (See NFPA 10, Standard for Portable Fire Extinguishers.)

A-X-5.3.6 Automatic sprinklers are needed in the above areas due to the difficulty of hand fire fighting in concealed, enclosed, or elevated areas.

X-5.3.7 All motor and switch gear enclosures shall be provided with approved, suitable portable fire extinguishers in accordance with NFPA 10, Standard for Portable Fire Extinguishers.

X-5.3.8 Power-operated, shovel- or scoop-type vehicles, dozers or similar equipment should shall be available for use in moving stored material for fire fighting. With the use of this equipment, surface types of pile fires can usually be removed from the affected areas and extinguished.

Where deep seated fires occur within the pile or under the pile in tunnels or other enclosures, this equipment is invaluable in breaking down the entire pile and spreading it out in a safe yard area, which allows fire fighters using hand hose lines or deluge units to extinguish both the pile and ground spread stored material.

A-X-5.3.8 With the use of this equipment, surface types of pile fires can usually be removed from the affected areas and extinguished.

Where deep-seated fires occur within the pile or under the pile in tunnels or other enclosures, this equipment is invaluable in breaking down the entire pile and spreading it out in a safe yard area, which allows fire fighters using

hand hose lines or deluge units to extinguish both the pile and ground-spread stored material.

X-5.3.9 Temporary conveyors and motors on the surface or adjacent to the piles should shall be avoided.

X-5.3.10 Physical protection should shall be provided to prevent heat sources such as steam lines, air lines, electrical motors, and mechanical drive equipment from becoming buried or heavily coated with combustible material. A high standard of housekeeping should shall be maintained around all potential heat sources.

X-5.3.11 Care should shall be exercised to prevent tramp metal from entering the piles, or sections of blower pipes from being buried in the piles. Tramp metal collectors or detectors, or both, are recommended required on all conveyor and blower systems.

X-5.4 Exposure Protection.

X-5.4.1 Experience indicates that radiated heat from exposing fires in storage piles does not ordinarily pose a serious ignition threat to other piles provided that recommended clear spaces are maintained. Flying brands from exposing fires, especially during high winds, do present a hazardous ignition source. Upwind forest or brush fires can also present a problem in relation to flying sparks and brands. Incinerators or open refuse burning should shall not be permitted in any area where sparks could reach the storage piles.

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X-5.4.2 Buildings or other structures near storage piles can pose a serious exposure hazard to the pile. A clear space should shall be maintained between piles and exposing structures, yard equipment, or stock, depending on the degree of exposure hazard. Pile-to-pile clearance of at least 30 ft (9.1 m) at the base of the pile should shall be provided. Greater clearance is desirable when piles are high and side slopes are greater than 60 degrees.

A-X-5.4.2 Buildings or other structures near storage piles can pose a serious exposure hazard to the pile.

X-6 Outside Storage of Logs.

X-6.1 Application.

X-6.1.1 The intent of this these guidelines section is to provide minimum fire protection guidance provisions to minimize the fire hazard in log yard storage areas containing saw, plywood, or pulpwood logs stored in ranked piles commonly referred to as cold decks. These guidelines This section does not apply to stacked piles of cordwood. However, where such material is stored in ranked piles, these guidelines can be used as a guide, recognizing that pile widths will be substantially narrower than the typical log cold deck contemplated herein. Each individual property will have its own special conditions for yard use, stock handling methods, and topography. For this reason, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved.

A-X-6.1.1 Each individual property will have its own special conditions for yard use, stock handling methods, and topography. For this reason, only basic fire protection principles are discussed herein, which are intended to be applied with due consideration of all local factors involved.

X-6.1.2 In addition to the guidelines requirements contained in this section, the provisions outlined in Section X-7 should shall apply to all outside storage of logs, except as modified herein.

X-6.2 General.

X-6.2.1 Fire loss experience in outside storage of logs indicates that large undivided piles, congested storage conditions, delayed fire detection, inadequate fire protection, and ineffective fire-fighting tactics are the principal factors that allow log pile fires to reach serious proportions.

The fire hazard potential inherent in log storage operations with large quantities of combustible materials can best be controlled by a positive fire prevention program under the direct supervision of top upper level management and should shall include the following:

- (1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based upon sound fire prevention and protection principles
- (2) Facilities for early fire detection, transmission of alarm and fire extinguishment, (see NFPA 72, National Fire Alarm Code);
- (3) Fire lanes to separate large pile and provide access for effective fire-fighting operations
- (4) Separation of yard storage from mill operations and other exposing operations
- (5) An effective fire prevention maintenance program, including regular yard inspections by trained personnel

A-X-6.2.1 Fire loss experience in outside storage of logs indicates that large undivided piles, congested storage conditions, delayed fire detection, inadequate fire protection, and ineffective fire-fighting tactics are the principle factors that allow log pile fires to reach serious proportions.

X-6.2.2 Special problems of construction and protection are involved when logs are stored on piers or wharves. Logs stored on piers or wharves shall be in accordance with NFPA 307, Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves, and the authority having jurisdiction should be consulted in each case.

X-6.3 Basic Log Yard Protection.

X-6.3.1 The storage site should be reasonably level, solid ground, preferably paved or surfaced with material such as cinders, fine gravel, or stone. Refuse- or sawdust-filled land, swampy ground, or areas where the hazard of underground fire is present should not be used.

X-6.3.2 Access to the plant and yard from public highways should be provided by all-weather roadways capable of supporting fire department apparatus.

X-6.3.3 All sides of each cold deck should be accessible by means of fire lanes. A fire lane width of 1 1/2 times the pile height but not less than 20 ft (6.1 m) should be provided, with fire lanes between alternate rows of two pile groups providing a clear space of at least 100 ft (30.5 m). The length of each cold deck should not exceed 500 ft (152.4 m); 300 ft (91.4 m) in width and 20 ft (6.1 m) in height. Fire lanes for access across each end, providing a clear space of at least 100 ft (30.5 m) to adjacent pile rows or other exposed property, should be provided. Where practical, greater widths are desirable to minimize the effects of radiated heat, particularly in high piled yards. (See Figure X-6.3.3.)

Exception: With the approval of the Authority Having Jurisdiction, the size of cold decks shall be allowed to be increased when additional fire flow and fixed fire protection equipment is provided.

A-X-6.3.3 Where practical, greater widths are desirable to minimize the effects of radiated heat, particularly in high piled yards.

X-6.3.4 For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

Where large scale fire-fighting operations can be expected, larger water supplies with adequate mains are needed. (See X-6.4.4.)

For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached so as to permit rapid hose laying to all parts of the piling areas. For this reason, hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61 m) of hose. Hydrants preferably should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 13, Standard for the Installation of Sprinkler Systems.) Water Supplies shall be provided in accordance with NFPA 1, Uniform Fire Prevention code.

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X-6.3.5 Dynamite should never be used as a means to reclaim frozen log piles.

X-6.3.6 During dry weather, piles should be wet down periodically. The installation of a portable piping system equipped with irrigation or lawn-type sprinklers on the top of each log pile is recommended.

X-6.3.7 Pile height shall be limited to 20 ft (6.1 m).

A-X-6.3.7 Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations since successful extinguishment of log pile fires requires penetration of the pile from the side by hose streams.

X-6.4 Special Log Yard Protection:

X-6.4.1 Small log yards containing a single cold deck of low height [10 ft (3 m) or less], having good access and well separated from other property, present minimum hazards that generally require only the basic protection provisions of X-6.3 for effective fire control. Higher piles, multiple piles over extensive areas, congested storage, or serious exposure situations present increased hazards that require additional safeguards and protection facilities. In yards requiring more than the basic protection provisions of X-6.3 for effective fire control, the following provisions should be followed. The relative importance of these provisions and the degree to which they could be needed will vary with yard conditions, and the authority having jurisdiction should be consulted in all cases:

X-6.4.2 Adequate water supplies and large mains should be provided to supply large stream equipment such as portable turrets and deluge sets, which require 750 gpm to 1000 gpm (47 L/sec to 63 L/sec) for each appliance. Monitor towers can require supplies in excess of 1000 gpm (63 l/sec) for each unit. In large yards where the hazard is severe, many of these devices could need to be operated simultaneously.

X-6.4.3 Fire lanes suitable for fire department operations should be provided as outlined in X-6.3.3. Fire lanes should be kept unobstructed. They should have an all-weather surface sufficiently strong to support fire apparatus and should be of sufficient width to permit maneuvering of motorized fire apparatus.

X-6.4.4 Pile heights should be limited. Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations since successful extinguishment of log pile fires requires penetration of the pile from the side by hose streams. Where pile heights exceed 20 ft (6.1 m), it is recommended that elevated monitor nozzles or mobile elevated nozzles, or both, be provided, and mobile elevated nozzles should be considered when piling height exceeds 12 ft (3.7 m):

X-7 General Fire Protection.

X-7.1 Application.

X-7.1.1 The two key points to reducing fire losses in areas used for the storage of forest products are reduction of the sources of fire ignition and a positive program for early detection and extinguishment of incipient fires. Application of the principles of fire prevention in X-7.2 can reduce fire occurrences. Principles of good fire protection are set forth in X-7.3 and X-7.4:

X-7.1.2 The provisions contained in Section X-7 shall These principles are intended to apply to all facilities as outlined in Sections X-2 through X-6.

X-7.2 Operational Fire Prevention.

X-7.2.1 Weeds, grass, and similar vegetation should be prevented throughout the entire yard and any vegetation growth should be sprayed and often as needed with a satisfactory herbicide or ground sterilizer, or grubbed out. Dead weeds should be removed after destruction. Weed burners should not be used.

X-7.2.2 Good housekeeping should be maintained at all times, including regular and frequent cleaning of materials handling equipment. Combustible waste materials such as bark, sawdust, chips, and other debris should not be permitted to accumulate in a quantity or location that will constitute an undue fire hazard.

A-X-7.2.2 Good housekeeping should be maintained at all times, including regular and frequent cleaning of materials handling equipment.

X-7.2.3 Smoking should be prohibited except in specified safe locations: approved by the Authority Having Jurisdiction. "No Smoking" signs should be posted in those areas where smoking is prohibited, and signs indicating areas designated as safe for smoking should be posted in those locations. Smoking areas should be provided with approved, noncombustible ash receptacles. Smoking should be specifically prohibited in and around railroad cars.

X-7.2.4 Access into the yard areas by unauthorized persons should be prohibited. Where needed, storage areas should be enclosed with a suitable fence equipped with proper gates located as necessary to allow the entry of fire department apparatus.

X-7.2.5 Miscellaneous occupancy hazards such as vehicle storage and repair shops, cutting and welding operations, flammable liquid storage, liquefied petroleum gas storage, and similar operations should be safeguarded in accordance with recognized good practice. Refer to various NFPA standards applicable to specific occupancy hazards.

X-7.2.6 Vehicles and other power devices should be of an approved type and should be safely maintained and operated. Vehicle fueling operations should be conducted in specified safe locations, isolated from storage areas and principle operating buildings. (See NFPA 505, Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation.)

X-7.2.6.1 Diesel- or gasoline-fueled vehicles that operate on hogged material or chip piles, in log storage areas, or in lumber storage areas should be equipped with fixed fire-extinguishing systems of a type approved for off-road vehicles.

X-7.2.7 All electrical equipment and installations should conform to the provisions of NFPA 70, National Electrical Code.

X-7.2.8 Salamanders, braziers, open fires, and similar dangerous heating arrangements should be prohibited. Heating devices should be limited to approved-type equipment installed in an approved manner.

X-7.2.9 Suitable safeguards should be provided to minimize the hazard of sparks caused by such equipment as refuse burners, boiler stacks, vehicle exhausts, and locomotives. Burning of shavings, sawdust, and refuse materials should be conducted only in an approved, enclosed refuse burner equipped with an approved spark arrester and located at a safe distance from the nearest point of any yard. See NFPA 82, Standard on Incinerators and Waste and Linen Handling Systems and Equipment, for small rubbish burners. The design and location of large burners presents special problems, and the authority having jurisdiction should be consulted.

X-7.2.10 Stacks from solid fuel-burning furnaces and boilers should be equipped with spark-arresting equipment to prevent hot sparks from reaching the ground, and consideration should be given to spark hazard in determining the height of such stacks.

X-7.2.11 Solid fuel-fired steam locomotives, cranes, and similar equipment entering or operating in yards should be equipped with heavy screening and hinged openings between the mud ring and the flare of the ash pan to prevent hot coals from dropping from the ash pan. It is recommended that front-end screens of coal-fired locomotives be examined at frequent intervals. Oil-fired steam equipment should be provided with fully enclosed drip pans to prevent burning oil from escaping. It is recommended that diesel locomotives be equipped with approved spark arresters or other devices to prevent the escape of glowing carbon particles from the exhausts.

X-7.2.12 If yard storage areas are located in regions highly susceptible to lightning strikes, consideration should shall be given to the installation of lightning protection on masts or towers to provide area protection. (See NFPA 780, Standard for the Installation of Lightning Protection Systems.)

X-7.2.13 No cutting, welding, or other use of open flames or spark-producing equipment should shall be permitted in the storage area unless by an approved permit system.

X-7.3 Exposure Protection.

X-7.3.1 Exposure to the Yard.

X-7.3.1.1 Yard areas should shall be separated from plant operations and other structures so that fire exposure into the yard will be minimized. Minimum separation should shall be by means of a clear space permanently available for fire-fighting operations. The width of the clear space should shall be based upon the severity of exposure, which will vary with the area, height, occupancy, construction, and protection of the exposing structure, and the type of stacking and height of adjacent stacks

X-7.3.1.2 Unsprinklered manufacturing buildings and other large structures with combustible contents represent a severe exposure to yard storage, unless the exterior walls have the necessary fire resistance to act as a fire separation and are essentially absent of unprotected openings. In general, unsprinklered saw mills, planing mills, treating plants, adzing mills, and similar buildings without essentially blank walls should shall be separated from yard storage by a clear space, as recommended by NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.

A-X-7.3.1.2 Unsprinklered manufacturing buildings and other large structures with combustible contents represent a severe exposure to yard storage, unless the exterior walls have the necessary fire resistance to act as a fire separation and are essentially absent of unprotected openings.

X-7.3.1.3 fully sprinklered structures present a lesser exposure hazard. Automatic sprinkler protection is desirable in all operating and principal storage buildings. Separation consideration between yards and sprinklered buildings will generally be determined by the seriousness of the exposure from the yards. (See X-7.3.2.)

X-7.3.1.4 Forest, brush, and grass fire exposure should shall be minimized by providing adequate clear space that is carefully kept free of combustible vegetation. Clear space of widths at least equivalent to fire lanes should shall be provided for grass exposures, and clear space of widths at least 100 ft (30.5 m) should shall be provided for light brush exposures. In forested areas, a wider clear space should shall be provided.

X-7.3.2 Exposure from the Yard:

X-7.3.2.1 fire exposure to adjacent structures and nearby property constitutes one of the major fire protection problems of forest products storage operations that can be solved satisfactorily only by cooperation between adjacent property owners. The authority having jurisdiction should be consulted in all cases:

X-7.3.2.2 special protection provisions discussed in these guidelines furnish a reasonable degree of protection against direct radiated heat through a combination of special protection facilities and controlled storage methods. It should be recognized, however, that these facilities cannot be expected to cope with adverse weather conditions and flying brands. Also, in situations where yard materials and storage methods need special protection facilities but where such protection (which includes adequate water supplies, fire department manpower, and equipment) is not available, exposure from the yard creates serious conflagration potential. Where these conditions prevail, additional protection against storage yard exposure should shall be provided, as practicable, by one or more of the following:

- (1) Providing greater clear space
- (2) Using barrier walls of such fire-resistive properties and stability that the passage of flames and heat can be effectively prevented for a prolonged period of time
- (3) Employing perimeter stacking methods that will furnish the equivalent of barrier walls (i.e., materials of greatest thickness and green flat stacked stock)
- (4) Using wall construction for exposed structures having adequate fire resistance
- (5) Using automatic sprinkler systems specially designed for protection of the exposed structures

X-7.4 Fire Detection and Extinguishment.

X-7.4.1 In all forest product storage operations, provisions should shall be made for early fire detection and extinguishment. These activities require watchmen and alarm service, plant emergency organization manpower and extinguishing equipment, and ready access by means of fire lanes into all parts of the storage areas so that fire extinguishing equipment can be promptly brought to the site of the fire.

X-7.4.2 When a fire is discovered, no matter how small, the public fire department and plant emergency organization should be notified at once. The telephone number of the fire department and the location of the nearest fire alarm box should be posted conspicuously in several locations in the yard and buildings:

X-7.4.3 In storage yards, a reliable means for prompt transmission of fire alarms to public fire departments and plant emergency organizations should shall be provided at convenient and accessible locations in the yard.

X-7.4.4 Standard, hourly watchman service should be maintained throughout the night and during all nonoperating periods. Watchmen should

be competent, and rounds should be supervised by an approved central station watchman's time detector or recorded by a portable watch clock:

X-7.4.5 Watchmen and other employees should be fully instructed in the proper procedure of transmitting a fire alarm and in the use of all fire protection equipment. (See NFPA 601, Standard for Security Services in Fire Loss Prevention.)

X-7.4.6 An industrial fire brigade should be organized. It should be well trained and adequately equipped to combat fire while the public fire department is responding to the alarm. (See NFPA 600, Standard on Industrial Fire Brigades.)

X-7.4.7 Portable fire extinguishers suitable for the fire hazard involved should shall be provided at convenient, conspicuously accessible locations in the yard. Where practicable, approved portable fire-extinguishing equipment should shall be placed so that maximum travel distance to the nearest unit should shall not exceed 75 ft (22.9 m). (See NFPA 10, Standard for Portable Fire Extinguishers.) Approved fire extinguishers of suitable type should shall be provided on all power vehicles and units, including haulage or private locomotives in the yard.

X-7.4.8 Water Supply. A public or private fire main and hydrant system with ample water supply should be provided, where adequate public fire protection is not available, private outside fire protection facilities should be provided. Water supplies shall be provided in accordance with NFPA 1, Uniform Fire Prevention Code.

X-7.4.8.1 Private Fire Service Mains and Hydrants. A private fire service main and hydrant system should be installed in accordance with NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances. Refer to NFPA 13, Standard for the Installation of Private Fire Service Mains and Their Appurtenances. Refer to NFPA 13, Standard for the Installation of Sprinkler Systems. Hydrants should be of an approved type and located so that any part of the yard can be reached with 200 ft (61-m) of hose. Where practicable, a 50 ft (15-m) separation should be provided between storage and yard hydrants:

X-7.4.8.2 Fire Pumps. Where provided, fire pumps should be installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection.

X-7.4.8.3 Pressure Tanks. Where provided, pressure tanks should be installed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.

X-7.4.8.4 Gravity Tanks. Where provided, gravity tanks should be installed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.

X-7.5 Testing and Maintenance of Fire Protection Systems. Water-based fire protection systems, such as fire pumps, storage tanks, fire hydrants, and their related equipment, should be tested and maintained in accordance with NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection System.

**SUBSTANTIATION:** Currently, there is no code or standard addressing the storage of forest products. The AHJ and the code user are left at a disadvantage as to the correct procedure and code that applies to these unique facilities. This proposal removes the current language from Appendix E of NFPA 230, Guideline for the Storage of Forest Products, and inserts this language a new chapter within NFPA 230. Significant changes have been made to Appendix E in order to transition from the guideline to a standard. The loss history of Lumberyards and Facilities that Store Building Material from 1991-1995 has been attached as supporting documentation. An update of these loss statistics has been requested from NFPA and will be provided to the Technical Committee as so as it becomes available.

Note: Supporting material is available for review at NFPA headquarters.

**COMMITTEE ACTION:** Accept in Principle

Accept submitter's recommended text into Chapter 9.

**COMMITTEE STATEMENT:** The committee agrees that material regarding storage of forest products should be located in the body of the standard. The committee is accepting in principle so that a task group can be formed to recommend specific language. The committee and task group would like to encourage comments with technical justification on this material.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:** 28  
**VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21

NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #17)

230-16-(Chapter 9) : Accept in Principle

**SUBMITTER:** Darrell W Harguth, Rep. UFC Special Hazards Task Group Chair

**RECOMMENDATION:** Replace existing Chapter 9 with new text:

X-6 Log Storage Areas.

X.6.1 General. Log storage areas shall be in accordance with this section.

X.6.2 Cold Decking. Cold decks shall not exceed 500 ft (152.4 m) in length, 300 ft (91.4 m) in width and 20 feet (6.1 m) in height. Cold decks shall be separated from adjacent cold decks or other exposures by a minimum of 100 ft (30.5 m).

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Exception: The size of cold decks protected by special fire protection in accordance with Section 1001.9 shall be permitted to be increased. Examples of such special fire protection include additional fire flow, portable turrets and deluge sets, and hydrant hose houses equipped with approved firefighting equipment capable of reaching the entire storage area.

X-7 Storage of Wood Chips and Hogged Material in Association with Timber and Lumber Production Facilities.

X.7.1 General. The storage of wood chips and hogged materials in association with timber and lumber production facilities shall be in accordance with this section.

X.7.2 Size of Piles. Piles shall not exceed 60 ft (18.2 m) in height, 300 ft (91.4 m) in width and 500 ft (152.4 m) in length. Piles shall be separated from adjacent piles or other exposures by fire department access roadways.

Exception: The size of piles protected by special fire protection in accordance with Section 1001.9 shall be permitted to be increased.

X.7.3 Pile Fire Protection. Automatic sprinkler protection shall be provided in conveyor tunnels and combustible enclosures that pass under a pile. Combustible or enclosed conveyor systems shall be protected by automatic sprinkler protection.

X.7.4 Material-handling Equipment. Approved material-handling equipment shall be readily available for moving wood chips and hogged material.

X.7.5 Emergency Plan. The owner or operator shall develop a plan for monitoring, controlling and extinguishing spot fires. This plan shall be submitted to the chief for review and approval.

X-8 Storage and Processing of Wood Chips, Hogged Material, Fines, Compost and Raw Product in Association with Yard Waste and Recycling Facilities.

X.8.1 General. The storage and processing of wood chips, hogged materials, fines, compost and raw product produced from yard waste, debris and recycling facilities shall be in accordance with this section.

X.8.2 Storage Site. Storage sites shall be reasonably level and be on solid ground or another all-weather surface. All sites shall be thoroughly cleaned before transferring wood products to the site.

X.8.3 Size of Piles. Piles shall not exceed 25 ft (7.6 m) in height, 150 ft (45.7 m) in width and 250 ft (76.2 m) in length.

Exception: The size of piles protected by special fire protection in accordance with Section 1001.9 shall be permitted to be increased.

X.8.4 Pile Separation. Piles shall be separated from adjacent piles by fire department access roadways.

X.8.5 Combustible Waste. The storage, accumulation and handling of combustible materials and control of vegetation shall be in accordance with Section 1103.

X.8.6 Static Pile Protection. Static piles shall be monitored by an approved means to measure temperatures within the static piles. Internal pile temperatures shall be monitored and recorded weekly. All records shall be kept on file at the facility and be made available for inspection. An operational plan indicating procedures and schedules for the inspection, monitoring and restricting of excessive internal temperatures in static piles shall be submitted to the chief for review and approval.

X.8.7 Pile Fire Protection. Automatic sprinkler protection shall be provided in conveyor tunnels and combustible enclosures that pass under a pile. Combustible or enclosed conveyor systems shall also be protected by automatic sprinklers.

X.8.8 Fire Extinguishers. Portable fire extinguishers with a minimum rating of 2-A:60-B:C shall be provided on all vehicles and equipment operating on piles and at all processing equipment.

X.8.9 Material-handling Equipment. Approved material-handling equipment shall be available for moving wood chips, hogged material, wood fines and raw product during firefighting operations.

X.8.10 Emergency Plan. The owner or operator shall develop a plan for monitoring, controlling and extinguishing spot fires and submit the plan to the chief for review and approval.

X.9-Exterior Storage of Finished Lumber Products

X.9.1 General. Exterior storage of finished lumber products shall be in accordance with this section.

X.9.2 Exterior Lumber Storage. Exterior lumber storage shall be in accordance with Section 1103.3.5. Lumber storage shall be arranged to form stable piles. Piles shall not exceed 150,000 ft<sup>3</sup>(4248 m<sup>3</sup>) in volume.

X.9.3 Security. Permanent lumber storage areas shall be surrounded with an approved fence. Fences shall be a minimum of 6 ft (1.8 m) in height.

Exception: Lumber piles inside of buildings and production mills for lumber, plywood and veneer do not require fences.

**SUBSTANTIATION:** Bringing forth these sections from the Uniform Fire Code, 2000 edition, will support the development of a more effective Fire Prevention Code by having such requirements available for extracting in the revised Fire Prevention Code.

**COMMITTEE ACTION:** Accept in Principle

See Committee Action on Proposal 230-15 (Log #18).

**COMMITTEE STATEMENT:** See Committee Statement on Proposal 230-15 (Log #18).

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**

**AFFIRMATIVE:** 21

**NOT RETURNED:** 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #22)

230-17-(A-3-1.3) : Accept in Part

**SUBMITTER:** Rick Thornberry, The Code Consortium Inc./Rep. AAMA Smoke Vent Task Group

**RECOMMENDATION:** Add a new paragraph to A-3-1.3 to be inserted between the second and third paragraphs to read as follows:

For guidance on smoke and heat venting see NFPA 204 Standard for Smoke and Heat Venting. Smoke and heat vents serve multiple functions in a building including property protection and fire fighter safety. Smoke and heat vents also facilitate fire fighting operations. Smoke and heat vents can help to minimize smoke and heat damage within the building in order to protect the building contents, as well as the building structure, by venting the smoke and hot gases directly to the exterior. They provided for fire fighter safety by minimizing or even eliminating the time required for fire fighters to be on the roof to ventilate the building in order to effectuate control and eventual extinguishment and overhaul of a fire condition. They also help to facilitate fire fighting operations by venting the smoke sufficiently so that the fire fighters can identify and reach the seat of the fire to more quickly extinguish it. This also contributes to fire fighter safety by providing adequate visibility for fire fighters to conduct their operations so that they do not become disoriented or lost and subsequently overcome by the smoke or hot gases generated by the fire.

**SUBSTANTIATION:** This proposal provides additional Annex A information on the importance and usefulness of smoke and heat vents.

This information should be of benefit to the users of this standard, especially the designer of a smoke and heat vent system who uses NFPA 204. This text provides guidance that will assist the designer in determining the design objectives of the smoke and heat vent system utilizing the newest edition of NFPA 204-2002 which has just completed the ROC phase of the NFPA standards revision process. That edition is basically a complete rewrite of the previous edition of NFPA 204-1998 which provides better guidance to the designer on how to utilize smoke and heat vents in both nonsprinklered and sprinklered buildings. It has also been converted from a guide to a standard.

**COMMITTEE ACTION:** Accept in Part

Accept first sentence of proposal only. Add additional sentence at end of second paragraph of Section A-3-1.3:

“For guidance on smoke and heat venting see NFPA 204.”

**COMMITTEE STATEMENT:** Apart from reference to NFPA 204, existing Annex A-3-1.3 is adequate.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**

**AFFIRMATIVE:** 21

**NOT RETURNED:** 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

**COMMENT ON AFFIRMATIVE:**

SCHUMANN: Assume that the first sentence of the proposal that was accepted will be revised as note in the committee action and added to the second paragraph.

(Log #8)

230-18-(A-3-2.1.2) : Reject

**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers

**RECOMMENDATION:** Move this Annex material to the body of the Standard, revise “should” to “shall” and renumber to 3-2.1.3.

**SUBSTANTIATION:** This requirement is not related to 3-2.1.2 and should be a separate requirement to reduce floor water damage to stock and preventing pile collapse.

**COMMITTEE ACTION:** Reject

**COMMITTEE STATEMENT:** No technical justification provided.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**

**AFFIRMATIVE:** 21

**NOT RETURNED:** 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

(Log #9)

230-19-(A-3-2.1.2) : Accept in Part

**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers

**RECOMMENDATION:** Move the “\*” for this Annex material to 3-2 or 3-2.1 if my other proposal on this section is rejected.

**SUBSTANTIATION:** This Annex material is only distantly related to 3-2.1.2 and is more general in nature.

**COMMITTEE ACTION:** Accept in Part

Make the recommended move to Section A-3-2.1.

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**COMMITTEE STATEMENT:** The annex section addresses piling procedures and precautions.  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-20-(A-3-4.1) : Accept (Log #11)  
**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers  
**RECOMMENDATION:** Delete Annex material as it is the same as 3-4.1.2 in the body of the Standard. Delete "\*" from 3-4.1.  
**SUBSTANTIATION:** Eliminates duplication of information.  
**COMMITTEE ACTION:**Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-24-(C-3-1.3) : Accept (Log #7)  
**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers  
**RECOMMENDATION:** Revise text as follows:  
Some of the rack storage fire tests that Tests were conducted as a part of the this program to develop protection criteria were run with eave-line window or louvers open to simulate smoke and heat venting. These tests opened 87.5 percent and 91 percent more sprinklers than did comparative tests without windows or louvers open.  
**SUBSTANTIATION:** This paragraph came from NFPA 231C and as such, the wording was appropriate. With its inclusion into NFPA 230, wording must be revised to better define what type of storage fire tests were done with open windows and louvers.  
**COMMITTEE ACTION:**Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-21-(A-3-4.3.2) : Accept in Part (Log #13)  
**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers  
**RECOMMENDATION:** Revise text as follows:  
A-3-4.3.3 ~~A-3-4.3.2~~ The use of welding, cutting, soldering, or brazing torches in the storage areas introduces a severe fire hazard. The use of mechanical fastenings and mechanical saws or cutting wheels is recommended. ~~Where welding or cutting operations are absolutely necessary, the requirements of NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, should apply. Locomotives should not be allowed to enter the storage area.~~  
**SUBSTANTIATION:** Corrects Annex reference if action on 3-4.3 is accepted and eliminates duplication of information. If the statement regarding locomotives still applies, it needs to be located elsewhere.  
**COMMITTEE ACTION:**Accept in Part  
Remove language suggested for deletion.  
**COMMITTEE STATEMENT:** Annex section is correct as is.  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith  
**COMMENT ON AFFIRMATIVE:**  
SCHUMANN: If committee action was to remove language suggested for deletion, then why the "Accept in Part"? The committee statement is also confusing. If it is correct as is, why delete wording?

230-25-(C-3-1.3) : Accept in Principle (Log #23)  
**SUBMITTER:** Rick Thornberry, The Code Consortium Inc./Rep. AAMA Smoke Vent Task Group  
**RECOMMENDATION:** Add text as follows:  
C-3-1.3 Tests were conducted as a part of this program with eave-line window or louvers open to simulate smoke and heat venting. These tests opened 87.5 percent and 91 percent more sprinklers than did comparative tests without windows or louvers open. Results from these tests do not necessarily provide an indication as to how automatic smoke and heat vents installed in the roof of a building would affect the operation of automatic sprinklers. See A-3.1.3.  
**SUBSTANTIATION:** This proposed new text simply provides additional information to clarify that there may not be any direct correlation between the simulated smoke and heat venting using eave-line windows and louvers versus the use of automatic smoke and heat vents installed in the roofs of buildings. In fact, studies have indicated that there is no correlation between the two types of venting methods. A more definitive evaluation (which is still not conclusive) can be found in the proposed referenced section of Annex A, A-3.1.3.  
**COMMITTEE ACTION:**Accept in Principle  
Add a sentence to the end of Section C-3-1.3 as follows:  
"Results from these tests may or may not provide an indication as to how smoke and heat vents installed in the roof of a building would affect the operation of automatic sprinklers."  
**COMMITTEE STATEMENT:** The committee agrees with the intent of the proposal but has clarified the wording to indicate that additional testing may be necessary, and that smoke and heat vents may be manually operated.  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-22-(A-3-4.3.2) : Accept (Log #CP21)  
**SUBMITTER:** Technical Committee on General Storage,  
**RECOMMENDATION:** Add the following language to the end of the first sentence of Section A-3-4.3.2:  
"...and wherever possible should be relocated to a designated area."  
**SUBSTANTIATION:** The committee recommends that all hot work involving storage occupancies be relocated to a designated area. However, this may not always be possible.  
**COMMITTEE ACTION:**Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman, Reed, Smith

230-26-(Appendix E) : Accept in Principle (Log #3)  
**SUBMITTER:** Ken Bush,  
**RECOMMENDATION:** Revise Appendix E into mandatory language and place as a new chapter in the body of the standard.  
**SUBSTANTIATION:** These requirements are contained in several model fire code documents as enforceable provisions. These provisions articulate the requirements to address the special challenges of fire prevention and fire protection that are unique to wood product manufacturing facilities and processes. Woodworking processes generally involve the reduction in size of wood pieces through mechanical means. This exothermic process coupled with the inherent dangers of combustible particulate provides significant fire and explosion conditions within these occupancies. The authority having jurisdiction should find these important regulatory provisions readily available as proposed to be set forth herein.  
**COMMITTEE ACTION:**Accept in Principle  
See Committee Action on Proposal 230-15 (Log #18).  
**COMMITTEE STATEMENT:** See Committee Statement on Proposal 230-15 (Log #18).

230-23-(B-3-1) : Accept (Log #CP22)  
**SUBMITTER:** Technical Committee on General Storage,  
**RECOMMENDATION:** Add an Item (8) to Section B-3.1 as follows:  
(8) Adequate clearance between the storage of combustible materials and pipelines, pipe bridges, cable trays and electrical transmission lines.  
**SUBSTANTIATION:** Storage of combustibles below utility lines pose the threat of loss of essential services in the event of ignition of stored material that potentially could prevent early detection of the fire or otherwise delay or impede firefighting operations.  
**COMMITTEE ACTION:**Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28

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**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman,  
Reed, Smith

(Log #6)

230-28-(Entire Document) : Accept  
**SUBMITTER:** Todd E. Schumann, Industrial Risk Insurers  
**RECOMMENDATION:** Revise all references to NFPA 13 to coincide with NFPA 13-2002.  
**SUBSTANTIATION:** NFPA 13-1999 is in cycle for May 2002. It is undergoing drastic changes to comply with NFPA's Manual of Style and reorganization of Chapter 7.  
**COMMITTEE ACTION:**Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman,  
Reed, Smith

(Log #5)

230-27-(Entire Document) : Reject  
**SUBMITTER:** Wayne Waggoner,  
**RECOMMENDATION:** Withdraw the entire document.  
**SUBSTANTIATION:** The document has been stripped of its core chapters by the incorporation of the sprinkler provisions into NFPA 13. The material could then be turned over to the Fire Prevention Committee to include in the fire code.

**COMMITTEE ACTION:**Reject  
**COMMITTEE STATEMENT:** The NFPA 230 requirements are established requirements that may currently be adopted by jurisdictions or other code groups. In addition, the Technical Committee on Storage is still active and is receiving/processing proposals.

**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 20  
NEGATIVE: 1  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman,  
Reed, Smith

**EXPLANATION OF NEGATIVE:**

**VICTOR:** I voted negative on Proposal 230-27 (Log #5) because a conflict will exist within the NFPA scope of documents. NFPA 230 no longer has special requirements unique to storage occupancies. The sprinkler requirements have already been extracted and included in NFPA 13. The building and storage arrangement requirements are included in the building code, or in other NFPA documents such as NFPA 1, 101, or 5000. I no longer see the need to have a separate storage document.

**COMMENT ON AFFIRMATIVE:**

**MALANGA:** I agree in principle with the submitter. Based on what has become of NFPA 230 since the transformation from NFPA 231, with the accompanying extraction of sprinkler design criteria into NFPA 13, the logical course of action would be to transfer or coordinate the remaining requirements into the Fire Prevention Code (appropriate chapters) or other documents. An exception would include the wood and forest products storage material, which would be better suited in a standalone standard, i.e., not part of an Appendix. NFPA 230 could be reorganized to prepare and administer the "Forest Products" standard.

(Log #CP20)

230-29-(Entire Document) : Accept  
**SUBMITTER:** Technical Committee on General Storage,  
**RECOMMENDATION:** Restructure entire document to comply with the NFPA Manual of Style as follows:  
1. Chapter 1 to contain administrative text only.  
2. Chapter 2 to contain only referenced publications cited in the mandatory portions of the document.  
3. Chapter 3 to contain only definitions.  
4. All mandatory sections of the document must be evaluated for usability, adoptability, and enforceability language. Generate necessary committee proposals.  
5. All units of measure in document are converted to SI units with inch/pound units in parentheses.  
6. Appendices restructured and renamed as "Annexes."  
**SUBSTANTIATION:** Editorial restructuring, to conform with the 2000 edition of the NFPA Manual of Style.  
**COMMITTEE ACTION:**Accept  
**NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE:**28  
**VOTE ON COMMITTEE ACTION:**  
AFFIRMATIVE: 21  
NOT RETURNED: 7 Blumenthal, Hoover, Nelson, Maughan, Newman,  
Reed, Smith

# NFPA 230 — November 2002 ROP

## NFPA 230 Standard for the Fire Protection of Storage 2003 Edition

### Chapter 1 Administration

#### 1.1 Scope.

**1.1.1** This standard shall apply to the indoor and outdoor storage of materials representing the broad range of combustibles, including plastics, forest products, rubber tires, scrap tires, baled cotton, and roll paper.

**1.1.2** Storage configurations shall include palletized storage, solid-piled storage, and storage in bin boxes, on shelves, or on racks.

**1.1.3** This standard shall not apply to the following:

- (1) Unsprinklered buildings, except the following:
  - (a) Buildings containing baled cotton storage
  - (b) Certain rack storage arrangements protected by high-expansion foam systems in accordance with this standard.
- (2) Storage of commodities that, with their packaging and storage aids, would be classified as noncombustible
- (3) Unpackaged bulk materials such as grain, coal, or similar commodities but excluding wood chips and sawdust, which are addressed in Section 11.5.
- (4) Inside or outside storage of commodities covered by other NFPA standards, except where specifically mentioned herein (e.g., pyroxylin plastics).
- (5) Storage of high-hazard materials such as flammable liquids, which are required to be protected in accordance with the provisions of the following:
  - (a) NFPA 30, *Flammable and Combustible Liquids Code*
  - (b) NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*
  - (c) NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film*
  - (d) NFPA 58, *Liquefied Petroleum Gas Code*
  - (e) NFPA 232, *Standard for the Protection of Records*
  - (f) NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*
  - (g) NFPA 490, *Code for the Storage of Ammonium Nitrate*
- (6) Storage on plastic shelves on racks
- (7) Miscellaneous tire storage (**230-14**)

**1.2 Purpose.** The purpose of this standard shall be to provide a reasonable degree of protection based on accepted engineering principles, tests, data, and field experience.

#### 1.3 Application.

**1.3.1** Chapter 6 of this document shall apply to the indoor storage of normal combustibles (Class I through Class IV) and plastics that are stored palletized, solid-piled, in bin boxes, or on shelves.

**1.3.2** Chapter 7 of this document shall apply to the indoor storage of normal combustibles (Class I through Class IV) and plastics that are stored on racks.

**1.3.3** Chapter 8 shall apply to new facilities with indoor storage of usable tires and to existing facilities being converted to the indoor storage of usable tires. (**230-14**)

**1.3.4** Chapter 8 shall not apply to scrap tires storage (see Annex F). (**230-14**)

**1.3.5** Chapter 9 shall apply to new facilities with indoor storage of roll paper, and to existing facilities being converted to the indoor storage of roll paper, except for the following types of roll paper:

- (1) Waxed paper
- (2) Synthetic paper
- (3) Palletized roll paper storage other than storage on a single floor pallet or raised floor platform

**1.4 Retroactivity.** The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

**1.5 Equivalency.** Nothing in this standard shall be intended to restrict new technologies or alternate arrangements, provided that the level of protection prescribed by the standard is not lowered.

#### 1.6\* Units.

**1.6.1** Metric units of measurement in this standard shall be in accordance with the modernized metric system known as the International System of Units (SI).

**1.6.2** The liter unit shall be permitted to be used in this standard.

**1.6.3** Where a value for measurement as specified in this standard is followed by an equivalent value in other units, the first stated value shall be regarded as the requirement.

**1.6.4** The equivalent value for a measurement in SI shall be converted by multiplying the value by the conversion factor and then rounding the result to the appropriate number of significant digits.

### Chapter 2 Referenced Publications

**2.1 General.** The following documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

**2.2 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

- NFPA 1, *Fire Prevention Code*, 2000 edition
- NFPA 10, *Standard for Portable Fire Extinguishers*, 1998 edition.
- NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, 1999 edition.
- NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1999 edition.
- NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 1995 edition.
- NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2002 edition.
- NFPA 30, *Flammable and Combustible Liquids Code*, 2000 edition.
- NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products*, 1998 edition.
- NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film*, 2001 edition.
- NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 1999 edition.
- NFPA 58, *Liquefied Petroleum Gas Code*, 2001 edition.
- NFPA 70, *National Electrical Code*, 2002 edition.
- NFPA 72, *National Fire Alarm Code*, 1999 edition.
- NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*, 1999 edition.
- NFPA 101, *Life Safety Code*, 2000 edition.
- NFPA 220, *Standard on Types of Building Construction*, 1999 edition.
- NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*, 2000 edition.
- NFPA 232, *Standard for the Protection of Records*, 2000 edition.
- NFPA 307, *Standard for the Construction and Fire Protection of marine terminals, Piers, and Wharves*, 2000 edition
- NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*, 2000 edition.
- NFPA 490, *Code for the Storage of Ammonium Nitrate*, 1998 edition.
- NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation*, 1999 edition.
- NFPA 601, *Standard for Security Services in Fire Loss Prevention*, 2000 edition. (**230-7**)

**2.3 ASHRAE Publication.** American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.

ASHRAE 15, *Safety Code for Mechanical Refrigeration*, 1994.

### Chapter 3 Definitions

**3.1 General.** The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not included, common usage of the terms shall apply.

#### 3.2 NFPA Official Definitions.

**3.2.1\* Approved.** Acceptable to the authority having jurisdiction.

**3.2.2\* Authority Having Jurisdiction.** The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

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**3.2.3 Labeled.** Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is 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.

**3.2.4\* Listed.** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

**3.2.5 Shall.** Indicates a mandatory requirement.

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

**3.2.7 Standard.** A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

### 3.3 General Definitions.

**3.3.1\* Aisle Width.** The horizontal dimension between the face of the loads in racks under consideration. [See Figure A.3.3.1]

**3.3.2 Alleyway.** An accessible clear space between storage piles or groups of piles suitable for housekeeping operations, visual inspection of piling areas, and initial fire-fighting operations.

**3.3.3\* Available Height for Storage.** The maximum height at which commodities can be stored above the floor and still maintain necessary clearance from structural members and the required clearance below sprinklers. [13:3.9.3]

**3.3.4 Bale.** (no def.)

**3.3.4.1 Fire-Packed Cotton Bale.** A cotton bale within which a fire has been packed as a result of a process, ginning being the most frequent cause.

**3.3.4.2 Naked Bale.** An unwrapped cotton bale secured with wire or steel straps.

**3.3.5\* Baled Cotton.** A natural seed fiber wrapped and secured in industry-accepted materials, usually consisting of burlap, woven polypropylene, or sheet polyethylene, and secured with steel, synthetic, or wire bands, or wire; also includes linters (lint removed from the cottonseed) and motes (residual materials from the ginning process).

**3.3.6 Block.** A basic yard storage unit for baled cotton comprising multiple-row storage with clear spaces on all sides.

**3.3.7 Bulkhead.** A vertical barrier across a rack.

**3.3.8 Burn-It.** A fire-fighting strategy that allows for the free-burn of a tire fire.

**3.3.9 Bury-It.** A fire-fighting strategy in which a tire pile is buried with soil, sand, gravel, cement dust, or other cover material.

**3.3.10\* Chip.** A wood chip of various species used in the manufacture of pulp.

**3.3.11 Clear Space.** An area that is free of combustible materials but that can contain noncombustible materials that cannot transmit an exposure fire.

**3.3.12 Clearance.** The distance from the top of storage to the ceiling sprinkler deflectors. [13:3.9.5]

**3.3.13 Cold Cotton.** Baled cotton that is five or more days old after the ginning process.

**3.3.14 Cold Deck.** A single ranked pile of logs with individual logs of regular or irregular length usually 20 ft (6.1 m) to 50 ft (15.2 m) long, but greater than 8 ft (2.4 m) long.

**3.3.15 Column (Paper).** A single vertical stack of rolls of paper.

**3.3.16 Commodity.** The combination of products, packing material, and container that determines commodity classification.

**3.3.17\* Compartmented.** The rigid separation of the products in a container by dividers that form a stable unit under fire conditions.

**3.3.18\* Container (Shipping, Master, or Outer Container).** A receptacle strong enough, by reason of material, design, and construction, to be shipped safely without further packaging.

**3.3.19\* Conventional Pallets.** A material-handling aid designed to support a unit load with openings to provide access for material-handling devices. [See Figure A.3.3.26.]

**3.3.20 Cordwood.** Logs 8 ft (2.4 m) or less in length customarily intended for pulpwood or fuel uses.

**3.3.21 Core.** The central tube around which paper is wound to form a roll.

**3.3.22 Cunit.** 100 ft<sup>3</sup> (2.8 m<sup>3</sup>) of solid wood or 100 ft<sup>3</sup> (2.8 m<sup>3</sup>) of chips or hogged material.

**3.3.23\* Encapsulated.** A method of packaging that consists of a plastic sheet that completely encloses the sides and top of a pallet load that contains a combustible commodity or a combustible package or a group of combustible commodities or combustible packages or combustible commodities that are individually wrapped in plastic sheeting and stored exposed in a pallet load.

**3.3.24 Fines.** Small pieces or splinters of wood by-products that can pass through a 0.25-in. (6.4-mm) screen. (230-1)

**3.3.25 Fire Lane.** A clear space suitable for fire-fighting operations by motorized fire apparatus.

**3.3.26 Flameover.** A fire that spreads rapidly over the exposed linty surface of the cotton bales. In the cotton industry, the common term is flashover and has the same meaning.

**3.3.27 Flashover.** For the storage of baled cotton, see definition of *Flameover*. (230-2)

**3.3.28 Forecasting.** The ability to predict fire progression in a scrap tire storage location prior to the completion of the inventory fire break using heavy equipment.

**3.3.29 Height.** (no def.)

**3.3.29.1 Ceiling Height.** The distance between the floor and the underside of the ceiling above (or roof deck) within the storage area.

**3.3.29.2 Roof Height.** The distance between the floor and the underside of the roof deck within a storage area.

**3.3.30 Hogged Material.** Mill waste consisting mainly of hogged bark but possibly including a mixture of bark, chips, dust, or other by-products from trees; also includes material designated as hogged fuel.

**3.3.31 Horizontal Channel.** Any uninterrupted space in excess of 5 ft (1.5 m) in length between horizontal layers of stored tires that is formed by pallets, shelving, racks, or other storage arrangements. (230-3)

**3.3.32.1 Ranked Log Piles.** Piles of logs evenly arranged by conveyor, crane, or other means.

**3.3.32.2 Stacked Log Piles.** Piles of logs in which logs are generally conveyed to the center of a pile, creating a cone-shaped appearance.

**3.3.33 Lumber.** Boards, dimension lumber, timber, plywood, and other similar wood products.

**3.3.34 Noncombustible.** Commodities, packaging, or storage aids that do not ignite, burn, or liberate flammable gases when heated to a temperature of 1380°F (749°C) for 5 minutes.

**3.3.35 Packaging.** A commodity wrapping, cushioning, or container. [13:3.9.13]

**3.3.36 Paper.** The general term for felted sheets made from natural fibrous materials, usually vegetable but sometimes mineral or animal, and formed on a fine wire screen by means of water suspension.

**3.3.37\* Rack.** Any combination of vertical, horizontal, and diagonal



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members that supports stored materials.

**3.3.37.1 Double-Row Rack.** Two single-row racks placed back-to-back having a combined width up to 12 ft (3.7 m), with aisles of at least 3.5 ft (1.1 m) on each side.

**3.3.37.2\* Movable Rack.** A racks on fixed rails or guides.

**3.3.37.3 Multiple-Row Rack.** A rack greater than 12 ft (3.7 m) wide or a single- or double-row rack separated by aisles less than 3.5 ft (1.1 m) wide having an overall width greater than 12 ft (3.7 m).

**3.3.37.4\* Portable Rack.** A rack that is not fixed in place.

**3.3.37.5 Single-Row Rack.** A rack that has no longitudinal flue space and that has a width up to 6 ft (1.8 m), with aisles at least 3.5 ft (1.1 m) from other storage.

**3.3.38 Row.** A minimum yard storage unit comprised of adjoining cotton bales.

**3.3.39 Solid Shelving.** Solid, slatted, and other types of shelving located within racks that obstruct sprinkler water penetration down through the racks. [13:3.10.5]

**3.3.40 Storage.** (no def.)

**3.3.40.1 Banded Storage.** Paper rolls provided with a circumferential steel strap  $\frac{3}{8}$  in. (9.5 mm) or wider, at each end of the roll.

**3.3.40.2 Banded Tire Storage.** Storage in which a number of tires are strapped together.

**3.3.40.3 Bin Box Storage.** Storage in five-sided wood, metal, or cardboard boxes with open face on the aisles that are self-supporting or supported by a structure so designed that little or no horizontal or vertical space exists around boxes.

**3.3.40.4 Block Storage.** Bales of cotton closely stacked in cubical form and enclosed by aisles or building sides, or both.

**3.3.40.5 Cartoned Storage.** Storage consisting of corrugated cardboard or paperboard containers that fully enclose the commodity.

**3.3.40.7 Laced Storage.** Storage of tires so that the sides of the tires overlap, creating a woven or laced appearance. [See Figure A.6.29g]

**3.3.40.8\* Miscellaneous Storage.** Storage that does not exceed 12 ft (3.7 m) in height and is incidental to another occupancy use group.

**3.3.40.9\* Miscellaneous Tire Storage.** The storage of rubber tires that is incidental to the main use of the building in an area not exceeding 2000 ft<sup>2</sup> (186 m<sup>2</sup>). On-tread storage piles, regardless of storage method, are not to exceed 25 ft (7.6 m) in the direction of the wheel holes. Acceptable storage arrangements include the following:

- (1) On-floor, on-side storage up to 12 ft (3.7 m) high
- (2) On-floor, on-tread storage up to 5 ft (1.5 m) high
- (3) Double-row or multirow fixed or portable rack storage on-side, or on-tread, up to 5 ft (1.5 m) high
- (4) Single-row fixed or portable rack storage on-side, or on-tread, up to 12 ft (3.7 m) high
- (5) Laced tires in racks up to 5 ft (1.5 m) high

**3.3.40.10 On-Side Storage.** Storage of tires in the horizontal or flat position.

**3.3.40.11 On-Tread Storage.** Storage of tires in the vertical position or on their treads.

**3.3.40.12 Palletized Storage.** Storage of commodities on pallets or other storage aids that form horizontal spaces between tiers of storage.

**3.3.40.13 Paper Storage.** (no def.)

**3.3.40.13.1 Horizontal Paper Storage.** Storage of paper rolls with the cores in the horizontal plane; also known as on-side storage.

**3.3.40.13.2 Vertical Paper Storage.** Storage of rolls with the cores in the vertical plane; also known as on-end storage.

**3.3.40.13.3\* Wrapped Paper Storage.** Storage of rolls in which the rolls are provided with a complete heavy kraft covering around both sides and ends.

**3.3.40.14 Pyramid Storage.** On-floor storage in which commodities are formed into a pyramid to provide pile stability.

**3.3.40.15 Shelf Storage.** Storage on structures less than 30 in. (76.2 cm) deep with shelves usually 2 ft (0.6 m) apart vertically and separated by approximately 30-in. (76.2-cm) aisles.

**3.3.40.16 Tiered Storage.** A storage which cotton bales are stacked two or more bales high directly on the floor or ground, usually on dunnage where stored outdoors.

**3.3.40.17 Yard Storage.** Storage of commodities in outdoor areas.

**3.3.41 Storage Aid.** A commodity storage device such as a shelf, a pallet, dunnage, a separator, or a skid.

**3.3.42 Tactics.** The method of securing the objectives laid out in the strategy through the use of personnel and equipment to achieve optimum results. [1051: ]

**3.3.43 Tire.** (no def.)

**3.3.43.1 Rubber Tire.** A pneumatic tire used on passenger automobiles, aircraft, light and heavy trucks, trailers, farm equipment, construction equipment (off-the-road), and buses.

**3.3.43.2 Scrap Tire.** A tire that can no longer be used for its original purpose due to wear or damage.

**3.3.43.3 Shredded Tire.** A scrap tire reduced in size by a mechanical processing device, commonly referred to as a shredder.

**3.3.44 Tire Chip.** A classified scrap tire particle that has a basic geometrical shape, which is generally 2 in. (51 mm) or smaller with most of the wire removed.

**3.3.45 Yard.** (no def.)

**3.3.45.1 Baled Cotton Yard.** A storage unit consisting of multiple storage blocks subject to bale and clear space limitations.

**3.3.45.2 Designated Yard.** An area marked by boundary lines intended for outside storage purposes only.

**3.3.45.3 Group of Yards.** Multiple outdoor storage areas with maximum block and minimum clear space limitations for baled cotton.

**3.3.45.4 Quarantine Yard.** A segregated area for the storage of baled cotton of known or suspect fire-packed bales.

### Chapter 4 General Design Basis

**4.1 Classification of Storage.** Classification of storage shall be determined based on the makeup of individual storage units in accordance with this document and NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**4.2 Usage Changes.**

**4.2.1** Changes in the commodities, packaging, or storage methods shall require an evaluation of the existing protection features including sprinkler systems where installed.

**4.2.2** Protection features shall be in accordance with this standard and NFPA 13, *Standard for the Installation of Sprinkler Systems*, when a change occurs in the commodities being stored, packaging, or storage method.

### Chapter 5 General Requirements

**5.1 Building Construction.**

**5.1.1\* Construction Type.** Buildings used for storage of materials that are stored and protected in accordance with this standard shall be permitted to be of any of the types described in NFPA 220, *Standard on Types of Building Construction*.

**5.1.2 Fire-Fighting Access.** Access shall be provided to all portions of the premises for fire-fighting purposes.

**5.1.3\* † Emergency Smoke and Heat Venting.**

**5.1.3.1** Protection outlined in this standard shall apply to buildings with or without smoke and heat vents. (230-4)

**5.1.3.2** Protection outlined in this standard shall apply to buildings with or without draft curtains.

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**5.1.3.3** Where local codes require smoke and heat vents in buildings protected by early suppression fast response (ESFR) sprinklers, the vents shall be manually operated or have an operating mechanism with a standard response fusible element rated no less than 360°F (182°C). (230-4)

### 5.2 Storage Arrangement.

#### 5.2.1\* Piling Procedures and Precautions. (230-19)

**5.2.1.1** Any commodities that are hazardous in combination with each other shall be stored so they cannot come into contact with each other.

**5.2.1.2** Safe floor loads shall not be exceeded. (230-19)

**5.2.1.3** Where storing water-absorbent commodities, normal floor loads shall be reduced to take into account the added weight of water that can be absorbed during fire-fighting operations.

#### 5.2.2 Commodity Clearance.

**5.2.2.1** The clearance between top of storage and sprinkler deflectors shall conform to NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**5.2.2.2\*** If the commodity is stored above the lower chord of roof trusses, at least 1 ft (30.5 cm) of clear space shall be maintained to allow wetting of the truss, unless the truss is protected with 1-hour fireproofing.

**5.2.2.3** Storage clearance from ducts shall be maintained in accordance with Section 2.18 of NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*.

**5.2.2.4** The clearance between stored materials and unit heaters, radiant space heaters, duct furnaces, and flues shall not be less than 3 ft (0.9 m) in all directions or shall be in accordance with the clearances shown on the approval agency label.

**5.2.2.5\*** Clearance shall be maintained to lights or light fixtures to prevent ignition.

**5.2.2.6** Operation clearance shall be maintained around the path of fire door travel.

**5.2.2.7** Operation and inspection clearance shall be maintained around fire extinguishing and protection equipment.

#### 5.2.3 Aisles.

**5.2.3.1** For the storage of commodities that expand with the absorption of water, such as roll paper, wall aisles at least 24 in. (61 cm) wide shall be provided.

**5.2.3.2\*** Aisles shall be maintained to retard the transfer of fire from one pile to another and to allow convenient access for fire fighting, salvage, and removal of storage.

#### 5.2.4\* Storage of Idle Pallets.

**5.2.4.1\* Wood Pallets.** Pallets shall be stored in one of the following locations:

- (1) Outside
- (2) In a detached structure
- (3) Indoor wood pallet storage in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*

**5.2.4.2 Plastic Pallets.** Plastic pallets shall be stored in one of the following locations:

- (1) Outside
- (2) In a detached structure
- (3) Indoors where storage is in accordance with NFPA 13

#### 5.2.5 Flammable and Combustible Liquids.

**5.2.5.1** Flammable or combustible liquids shall be kept in flammable liquid storage cabinets, in cutoff rooms, or in detached buildings.

**5.2.5.2** Protection shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

### 5.3 Fire Protection — General.

#### 5.3.1\* Sprinkler Systems.

**5.3.1.1** Sprinkler systems installed in buildings used for storage shall be in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*

**5.3.1.2** In warehouses containing storage, the chapter applicable to the storage configuration and commodity type shall apply in addition to the requirements of this chapter.

#### 5.3.2 High-Expansion Foam.

**5.3.2.1** High-expansion foam systems installed in addition to automatic sprinklers shall be installed in accordance with NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, except where modified by this standard.

**5.3.2.2** High-expansion foam used to protect the idle pallets shall have a maximum fill time of 4 minutes.

**5.3.2.3** High-expansion foam systems shall be automatic in operation.

**5.3.2.4** Detectors for high-expansion foam systems shall be listed and shall be installed at the ceiling at no more than one-half the listed spacing in accordance with NFPA 72<sup>+</sup>, *National Fire Alarm Code*<sup>®</sup>.

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

#### 5.3.3 Manual Protection.

##### 5.3.3.1 Portable Fire Extinguishers.

**5.3.3.1.1** Portable fire extinguishers shall be provided in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, unless 5.3.3.1.2 applies.

**5.3.3.1.2** Where 1-in. hose lines are available to reach all portions of areas with Class A fire loads, up to one-half of the portable fire extinguishers required by NFPA 10, *Standard for Portable Fire Extinguishers*, shall be permitted to be omitted.

**5.3.3.2 Hydrants.** At locations without public hydrants, or where hydrants are not within 250 ft (76.2 m), private hydrants shall be installed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

##### 5.3.4 Fire Organization.

**5.3.4.1** Arrangements shall be made to allow rapid entry into the premises by the municipal fire department, police department, or other authorized personnel in case of fire or other emergency.

**5.3.4.2** Due to the unique nature of storage fires and the hazards associated with fighting such fires (see *Annex F and Annex G*), facility emergency personnel shall be trained to have knowledge of the following:

- (1) The severe collapse potential during fire fighting and mop-up operations due to sprinkler water absorption, use of hose streams, and the undermining of piles by fire that is likely to cause material or piles to fall (especially roll tissue paper) resulting in injury or worse
- (2) The operation of sprinkler systems and water supply equipment
- (3) The location of the controlling sprinkler valves so that the correct sprinkler system can be turned on or off as necessary
- (4) The correct operation of emergency smoke and heat vent systems where they have been provided
- (5) The use of material-handling equipment while sprinklers are operating to effect final extinguishment
- (6) The procedure for summoning outside aid immediately in an emergency
- (7) The maintenance of the maintaining security of the premises
- (8) The operation of foam systems, with knowledge of the appropriate evacuation procedures, and the ability to apply safety precautions during all foam operations.

**5.3.4.3** A fire watch shall be maintained when the sprinkler system is not in service.

##### 5.3.5 Alarm Service.

**5.3.5.1** Automatic sprinkler systems and foam systems, where provided, shall have approved central station, auxiliary, remote station, or proprietary waterflow alarm service unless otherwise permitted by 5.3.5.1.1 or 5.3.5.1.2. (230-7)

**5.3.5.1.1** Local waterflow alarm service shall be permitted when recorded guard service also is provided.

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**5.3.5.1.2** Local waterflow alarm service shall be permitted where the storage facilities are occupied on a 24-hour basis.

**5.3.5.2** Alarm service shall comply with NFPA 72, *National Fire Alarm Code*.

**5.3.6 Security Service.** Security service, where provided, shall comply with NFPA 601, *Standard for Security Services in Fire Loss Prevention*. (230-7)

### 5.4 Building Equipment, Maintenance, and Operations.

#### 5.4.1 Mechanical-Handling Equipment — Industrial Trucks. (230-20)

**5.4.1.1** Power-operated industrial trucks shall comply with NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation*.

**5.4.1.2†** Industrial trucks using liquefied petroleum gas (LP-Gas) or liquid fuel shall be refueled outside of the storage building at a location designated for the purpose.

**5.4.2 Building Service Equipment.** Electrical equipment shall be installed in accordance with the provisions of NFPA 70, *National Electrical Code*®.

#### 5.4.3 Cutting and Welding Operations.

**5.4.3.1** Where welding or cutting operations are necessary, the requirements of NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, shall apply. (230-8)

**5.4.3.2\*** Welding, soldering, brazing, and cutting shall be permitted to be performed on building components or contents that cannot be removed, provided that no storage is located below and within 25 ft (7.6 m) of the working area and flameproof tarpaulins enclose the area.

**5.4.3.3** During any of the operations identified in 5.4.3.2, all of the following shall apply:

- (1) The sprinkler system shall be in service.
- (2) Extinguishers suitable for Class A fires with a minimum rating of 2A shall be located in the working area.
- (3) Where inside hose lines are available, charged and attended inside hose lines shall be located in the working area.
- (4) A fire watch shall be maintained during the operations specified in 5.4.3.2 and for not less than 30 minutes following completion of open-flame operation.

#### 5.4.4 Waste Disposal.

**5.4.4.1** Approved containers for rubbish and other trash materials shall be provided.

**5.4.4.2** Rubbish, trash, and other waste material shall be disposed of at regular intervals.

#### 5.4.5 Smoking.

**5.4.5.1** Smoking shall be prohibited except in locations designated as smoking areas.

**5.4.5.2** Signs that read “No Smoking” shall be posted in prohibited areas.

#### 5.4.6\* Maintenance and Inspection.

**5.4.6.1** Fire walls, fire doors, and floors shall be operable at all times.

**5.4.6.2\*** Sprinkler systems and the water supplies shall be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

**5.4.7 Refrigeration Systems.** Refrigeration systems, if used, shall be in accordance with ASHRAE 15, *Safety Code for Mechanical Refrigeration*.

**5.4.8 Lighting.** Where metal halide lighting is installed, metal halide lighting shall be selected, installed and maintained such that failure of the bulb shall not create a fire hazard. (230-9)

### Chapter 6 Palletized, Solid Pile, Bin Box, and On-Shelf Storage (Reserved)

## Chapter 7 Rack Storage

### 7.1 Building Construction.

**7.1.1†** Fire protection of roof steel shall not be required when sprinkler systems are installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**7.1.2†** Fire protection of steel building columns and vertical rack members that support the building shall not be required when ceiling sprinklers and in-rack sprinklers are installed in accordance with Chapter of NFPA 13, *Standard for the Installation of Sprinkler Systems*. (230-10)

**7.1.3†** For sprinklered buildings with rack storage of over 15 ft (4.6 m) in height and only ceiling sprinklers installed, steel building columns within the rack structure and vertical rack members that support the building shall have a minimum 1-hour fire resistance rating unless the installation meets the requirements of 12.3.1.7 in NFPA 13, *Standard for the Installation of Sprinkler Systems*. (230-12)

### 7.2 Storage Arrangement.

**7.2.1\* Rack Structure.** Rack configurations shall be approved.

**7.2.2\* Rack Loading.** Racks shall not be loaded beyond their design capacity.

#### 7.2.3\* Aisle Widths.

**7.2.3.1** Aisle widths and depth of racks shall be determined by material-handling methods.

**7.2.3.2** The width of aisles shall be considered in the design of the protection system. (See Chapter 12 of NFPA 13, *Standard for the Installation of Sprinkler Systems*).

**7.2.3.3** Aisle widths shall be maintained by either fixed rack structures or control in placement of portable racks.

**7.2.3.4** Any decrease in aisle width shall require a review of the adequacy of the protection system.

#### 7.2.4 Fire Protection — General.

##### 7.2.4.1 High-Expansion Foam.

**7.2.4.1.1\*** Where high-expansion foam systems are installed, they shall be automatic in operation and shall be in accordance with NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, except when modified by this chapter.

**7.2.4.1.2** When high-expansion foam systems are used in combination with ceiling sprinklers, in-rack sprinklers shall not be required.

**7.2.4.1.3** Detectors shall be listed and shall be installed in one of the following configurations:

- (1) At the ceiling only when installed at one-half listed linear spacing (for example, 15 ft  $\nabla$  15 ft rather than at 30 ft  $\nabla$  30 ft) if the clearance from the top of storage does not exceed 10 ft (3.1 m) and the height of storage does not exceed 25 ft (7.6 m)
- (2) At the ceiling at listed spacing and on racks at alternate levels
- (3) When listed for rack storage installation, in accordance with ceiling detector listing to provide response within 1 minute after ignition using an ignition source equivalent to that used in a rack storage testing program

##### 7.2.5 High-Expansion Foam Submergence.

**7.2.5.1** The following requirements shall apply to storage of Class I, Class II, Class III, and class IV commodities, as defined in NFPA 13, *Standard for the Installation of Sprinkler Systems*, up to and including 25 ft (7.6 m) in height:

- (1)\* When high-expansion foam systems are used without sprinklers, the maximum submergence time shall be 5 minutes for Class I, Class II, or Class III commodities .
- (2) When high-expansion foam systems are used without sprinklers, the maximum submergence time shall be 4 minutes for Class IV commodities.
- (3) When high-expansion foam systems are used in combination with ceiling sprinklers, the maximum submergence time shall be 7 minutes for Class I, Class II, or Class III commodities.
- (4) When high-expansion foam systems are used in combination with ceiling sprinklers, the maximum submergence time shall be 5 minutes for Class IV commodities.

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**7.3.2.2** The following requirements shall apply to storage of Class I, II, III and IV commodities, as defined in NFPA 13, stored over 25 ft (7.6 m) high up to and including 35 ft (10.67 m) in height:

- (1) Ceiling sprinklers shall be used in combination with the high-expansion foam system.
- (2) The maximum submergence time for the high-expansion foam shall be 5 minutes for Class I, Class II, or Class III commodities.
- (3) The maximum submergence time for the high-expansion foam shall be 4 minutes for Class IV commodities.

### Chapter 8 Storage of Rubber Tires

#### 8.1 Building Arrangement.

**8.1.1 Steel Columns.** Steel columns shall be protected as follows unless protected in accordance with 12.3.1.7 of NFPA 13, *Standard for the Installation of Sprinkler Systems*:

- (1) For storage exceeding 15 ft to 20 ft (4.6 m to 6 m) in height, columns shall have 1-hour fireproofing.
- (2) For storage exceeding 20 ft (6 m) in height, columns shall have 2-hour fireproofing for the entire length of the column, including connections with other structural members.

#### 8.1.2 Fire Walls.

**8.1.2.1** Four-hour fire walls shall be provided between the tire warehouse and tire manufacturing areas.

**8.1.2.2** Fire walls shall be designed in accordance with NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*.

**8.1.3\* Travel Distance to Exits.** Travel distance to exits in storage occupancies shall be in accordance with NFPA 101<sup>®</sup>, *Life Safety Code*<sup>®</sup>.

#### 8.2 Storage Arrangement.

##### 8.2.1 Piling Procedures.

**8.2.1.1\*** Piles that are not adjacent to or located along a wall shall be a maximum of 50 ft (15 m) in width.

**8.2.1.2** Tires stored adjacent to or along one wall shall not extend more than 25 ft (7.6 m) from the wall.

**8.2.1.3** 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).

**8.2.1.4** The width of the main aisles between piles shall be not less than 8 ft (2.4 m).

##### 8.2.2 Clearances.

**8.2.2.1** Storage clearance from roof structures shall be not less than 18 in. (0.45 m) in all directions.

**8.2.2.2** A clearance of not less than 24 in. (0.6 m) shall be maintained around the path of fire door travel unless a barricade is provided.

**8.2.2.3** Where protection in accordance with this standard is provided, stored tires shall be segregated from other combustible storage by aisles at least 8 ft (2.4 m) wide.

#### 8.3 Fire Protection.

**8.3.1 Fire Emergency Organization.** See Annex F.

### Chapter 9 Protection of Roll Paper

**9.1\* Classification of Roll Paper.** For the purposes of this standard and for determining sprinkler system design criteria, the following classifications of paper shall apply:

- (1) Heavyweight class includes paperboard and paper stock having a basis weight [weight per 1000 ft<sup>2</sup> (92.9 m<sup>2</sup>)] of 20 lb (9.1 kg) or greater.
- (2) Mediumweight class includes the broad range of papers having a basis weight [weight per 1000 ft<sup>2</sup> (92.9 m<sup>2</sup>)] of 10 lb to 20 lb (4.5 kg to 9.1 kg).
- (3) Lightweight class includes all papers having a basis weight [weight per 1000 ft<sup>2</sup> (92.9 m<sup>2</sup>)] less than 10 lb (4.5 kg).
- (4) Tissue paper includes the broad range of papers of characteristic gauzy-texture, soft, absorbent type, regardless of basis weight.

**9.2\* Building Construction.** The protection outlined in this chapter shall apply to buildings with or without fireproofing or other modes of steel protection, unless modified by the requirements of 5.2.2.2.

**9.3 Storage Arrangement.** The floor load design shall take into account the added weight of water that could be absorbed by the commodity during fire-fighting operations.

### Chapter 10<sup>#</sup> Protection of Baled Cotton (Reserved)

### Chapter 11 Provisions for Storage of Forest Products

#### 11.1 General.

**11.1.1\* Purpose.** The intent of this chapter shall be to provide minimum fire protection requirements to minimize the fire hazard in areas used for the storage of forest products.

**11.1.2 Scope.** The provisions of this chapter shall apply to the following:

- (1) Retail and wholesale lumber storage yards
- (2) Outside storage of lumber and timber at other than retail or wholesale yards
- (3) Outside storage of ties, poles, piles, posts, and other similar forest products at pressure-treating plant yards
- (4) Outside storage of wood chips
- (5) Outside storage of logs
- (6) Outside storage of hogged material

#### 11.2 Retail and Wholesale Lumber Storage Yards.

##### 11.2.1 Application.

**11.2.1.1** The intent of the provisions of Section 11.2 shall be to provide minimum fire protection standards to minimize the fire hazard in the following areas:

- (1) Retail lumberyards handling forest products and other building materials
- (2) Wholesale lumber storage yards, including distribution, holding, and transshipment areas
- (3) Buildings in retail and wholesale lumberyards used for storage of forest products or auxiliary operations

**11.2.1.2** In addition to the provisions contained in Section 11.2, the provisions outlined in Section X-7 shall apply to all retail and wholesale lumber storage yards.

**11.2.1.3\*** The provisions outlined in Section 11.3 shall be used for large outside wholesale and distribution yards.

##### 11.2.2 General.

**11.2.2.1\*** The fire hazard potential inherent in lumber storage operations with large quantities of combustible material shall be controlled by a positive fire prevention program under the direct supervision of upper level management that shall include the following:

- (1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based proven fire prevention and protection principles
- (2) Facilities for early fire detection, transmission of alarm, and fire extinguishment
- (3) Fire lanes, as defined in NFPA 1, *Fire Prevention Code*, to separate large stacks and provide access for effective fire-fighting operations
- (4) Separation of yard storage from yard buildings and other exposing properties
- (5) Effective fire prevention maintenance program, including regular yard inspections by trained personnel.

**11.2.2.2** Cargo yards with lumber stored on piers or wharves and lumber stored on raised platforms shall be in accordance with NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*.

**11.2.2.3\*** Water supplies shall be provided in accordance with NFPA 1, *Fire Prevention Code*.

##### 11.2.3 Open Yard Storage.

**11.2.3.1** Lumber stacks shall be on stable ground, and paved or surfaced with materials such as cinders, fine gravel, or stone. Where the danger of underground fire is present, refuse-filled or sawdust-filled land shall not be used.

**11.2.3.2** The method of stacking shall be solid and in an orderly and regular manner.

**11.2.3.3\*** Empty pallets shall be stored in accordance with the provisions of Table 11.2.3.3(a) and Table 11.2.3.3(b).

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**Table 11-2.3.3(a) Required Clearance Between Outside Idle Pallet Storage and Building**

Wall Construction		Minimum Distance of Wall from Storage					
		Under 50 Pallets		Under 50 Pallets		Over 200 Pallets	
		ft	m	ft	m	ft	m
Wall Type	Openings						
Masonry	None	0	0	0	0	15	4.6
	Wired glass with outside sprinklers and 1-hour doors	0	0	10	3.0	20	6.1
	Wired or plain glass with outside sprinklers and 3/4-hour doors	10	3.0	20	6.1	30	9.1
Wood or metal with outside sprinklers		10	3.0	20	6.1	30	9.1
Wood, metal, or other		20	6.1	30	9.1	50	15.2

**Table 11-2.3.3(b) Required Clearance Between Outdoor Pallet Storage and Other Yard Storage**

Pile Size	Minimum Distance	
	ft	m
Under 50 pallets	20	6
50—200 pallets	30	9.1
Over 200 pallets	50	15.2

**11.2.3.4\*** The height of stacks shall not exceed 20 ft (6.1 m) with due regard for stability.

**11.2.3.5** Where stacks are supported clear of the ground, 6 in. (15.24 cm) of clearance shall be provided for cleaning operations under the stacks.

**11.2.3.6** Driveways shall be spaced so that a maximum grid system of not over 50 ft ¥ 150 ft (15.2 m ¥ 45.7 m) is produced.

**11.2.3.7** Driveways shall comply with the following:

(1) They shall have a minimum width of 15 ft (4.6 m) and an all-weather surface capable of supporting fire department apparatus.

(2) The radius of turns shall be designed to accommodate fire department apparatus.

**11.2.3.8** The following shall apply where the yard has earth or crushed stone drives

(1) Boundary posts with signs designating stacking limits shall be provided to indicate yard area and alley limits.

(2) In paved yard areas, painted boundary limits shall be permitted to be used instead of posts and signs.

**11.2.4 Buildings.**

**11.2.4.1\*** Automatic sprinkler protection for buildings used for indoor storage of forest products shall be designed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

**11.2.4.2** Where automatic sprinklers are not installed, large storage buildings shall be subdivided into compartments not exceeding area limits specified in generally accepted model buildings codes by fire walls or fire barrier walls in accordance with NFPA 221, *Fire Walls and Fire Barrier Walls*.

**11.2.5 Exposure Protection.**

**11.2.5.1\* Lesser Burnable Materials.** If present, lesser burnable materials (large-size timbers and flat-stacked stock) shall be stored or stacked on the perimeter of the yard to act as a barrier between the yard and adjacent properties or buildings.

**11.2.5.2 Exposure to the Yard.**

**11.2.5.2.1** Except as noted in 11-2.5.2.2, 11.2.5.2.3, and 11-2.3.3 open yard stacking shall be located with at least 15 ft (4.6 m) clear space to buildings.

**11.2.5.2.2\*** Building walls shall have sufficient fire resistance capability to contain a fire that originates in the building, and windows or other openings shall be reduced in size or adequately blocked to prevent radiant heat exposure to the open yard stacking. (*See 11-7.3.*)

**11.2.5.2.3\*** Unsprinklered buildings in which hazardous manufacturing or other operations take place, shall have at least 50 ft (15.2 m) of clear space to the nearest lumber stack, shed, or warehouse.

**11.2.5.2.4** Boundary posts with signs designating stacking limits shall be provided to designate the clear space to unsprinklered buildings in which hazardous manufacturing or other operations take place.

**11.2.5.3\* Exposure from the Yard.**

**11.2.5.3.1** Open yard stacking shall be located with at least 15 ft (4.6 m) clear space to adjacent property lines.

**11.2.5.3.2** Alternative forms of exposure protection shall be permitted where approved by the authority having jurisdiction.

**11.2.6 Special Fire Prevention.**

**11.2.6.1** All nonportable power woodworking machines, shall be equipped with refuse removal equipment conforming to NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*.

**11.2.6.2** Materials such as hay, coal, grain, and feed shall stored in separate buildings or in the open with 10 ft (3.05 m) clear space between yard buildings or open yard storage.

**11.3 Outside Storage of Lumber at Other than retail or Wholesale Yards.**

**11.3.1 Application.**

**11.3.1.1\*** The intent of the provisions of Section 11.3 shall be to provide minimum fire protection standards to minimize the fire hazard in large yard storage areas containing lumber, timber, and other similar wood products not intended for retail or wholesale distribution at the site.

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**11.3.1.2** In addition to the provisions contained in Section 11.3, the provisions outlined in Section X-7 shall apply to all large yard storage areas for lumber and timber at other than retail or wholesale yards.

### 11.3.2 General.

**11.3.2.1\*** The fire hazard potential inherent in lumber storage operations with large quantities of combustible material shall be controlled by a positive fire prevention program under the direct supervision of upper level management that shall include the following:

- (1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based on sound fire prevention and protection principles
- (2)\* Facilities for early fire detection, transmission of alarm, and fire extinguishment

**11.3.2.2** Cargo yards in which lumber is stored on piers or wharves and the lumber is stored on raised platforms present special problems of construction and protection and shall comply with the following:

- (1) NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, shall be consulted in each case.
- (2) The authority having jurisdiction shall be consulted in each case.

### 11.3.3 Lumberyard Protection.

**11.3.3.1\*** Water supplies shall be provided in accordance with NFPA 1, *Fire Prevention Code*.

**11.3.3.2** Access to the plant and yard from public highways shall be provided by all-weather roadways capable of supporting fire department apparatus.

**11.3.3.3** The storage site shall be reasonably level, solid ground, paved or surfaced with material such as cinders, fine gravel, or stone.

**11.3.3.4** Refuse- or sawdust-filled land, swampy ground, or areas where the hazard of underground fire is present shall not be used as a storage site.

**11.3.3.5** Stack height shall be limited to 20 ft (6.1 m).

### 11.4 Outside Storage of Ties, Poles, Piles, Posts, and Other Similar Forest Products at Pressure-Treating Plant Yards.

#### 11.4.1 Application.

**11.4.1.1\*** The intent of the provisions of Section 11.4 shall be to provide minimum fire protection standards to minimize the fire hazard in yard storage areas containing treated and untreated ties, poles, piles, posts, and other similar forest products in yards connected with pressure-treating plants, but shall not include the treating buildings, processes, or storage of treating materials.

**11.4.1.2** In addition to the provisions contained in Section 11.4, the provisions outlined in Section 11-7 shall apply to all outside storage of ties, poles, piles, posts, and other similar forest products at pressure-treating plant yards.

**11.4.2\* General.** The fire hazard potential inherent in tie storage operations with large quantities of combustible material shall be controlled by a positive fire prevention program under the direct supervision of upper level management that shall include the following:

- (1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based on sound fire prevention and protection principles
- (2) Facilities for early fire detection, transmission of alarm, and fire extinguishment
- (3) Fire lanes to separate large stacks and provide access for effective fire-fighting operations
- (4) Separation of yard storage from mill buildings and other exposing properties
- (5) Effective fire prevention maintenance program, including regular yard inspections by trained personnel

#### 11.4.3 Tie Yard Protection.

**11.4.3.1\*** Unobstructed alleyways of sufficient width for hand or cart fire hose laying operations shall be provided between piles.

- (A) A minimum alleyway width of 4 ft (1.2 m) shall be provided.
- (B) Alleyways shall be spaced so that initial fire-fighting operations can be effective.

**11.4.3.2** Water supplies shall be provided in accordance with NFPA 1, *Fire Prevention Code*.

**11.4.3.3** Access to the plant and yard from public highways shall be provided by all-weather roadways capable of supporting fire department apparatus.

**11.4.3.4** The storage site shall be level, solid ground, paved or surfaced with material such as cinders, fine gravel, or stone.

**11.4.3.5** Refuse-filled or sawdust-filled land, swampy ground, or areas where the hazard of underground fire is present shall not be used as storage site.

**11.4.3.6\*** Stack heights shall be limited to 20 ft (6.1 m).

### 11.5 Outside Storage of Wood Chips and Hogged Material.

#### 11.5.1 Application.

**11.5.1.1\*** The intent of the provisions of Section 11.5 shall be to provide minimum fire protection standards to minimize the fire hazard in yard storage areas containing wood chips and hogged material.

**11.5.1.2** In addition to the provisions contained in Section 11.5, the provisions outlined in Section 11-7 shall apply to all outside storage of wood chips and hogged material, except as modified herein.

#### 11.5.2 General.

**11.5.2.1\*** The fire hazard potential inherent in storage piles shall be controlled by a positive fire prevention program under the direct supervision of upper level management. That shall include the following:

- (1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based on sound fire prevention and protection principles
- (2) Establishment of control over the various factors that lead to spontaneous heating, including provisions for monitoring the internal condition of the pile
- (3) Facilities for early fire detection and extinguishments
- (4) Fire lanes around the piles and access roads to the top of the piles for effective fire-fighting operations
- (5) Facilities for calling the public fire department and facilities needed by the fire department for fire extinguishment
- (6) Effective fire prevention maintenance program, including regular yard inspections by trained personnel

**11.5.2.2** The following are items shall be considered when establishing operating procedures:

- (1) Refuse and old chips shall not be permitted in the chip pile base.
- (2) The storage site shall be reasonably level, solid ground, or shall be paved with blacktop, concrete, or other hard-surface material that has been thoroughly cleaned before starting a new pile.
- (3)\* Operating plans for the buildup and reclaiming of the pile shall be based on a maximum turnover time of 1 year under ideal conditions.
- (4)\* Piles containing other than screened chips made from cleaned and barked logs.
- (5)\* The pile size shall be limited.
- (6) Pile heights shall be kept low, particularly piles that inherently carry a larger percentage of fines and are subject to greater compaction. Such as, veneer chip piles, which shall be limited to 50 ft (15.2 m) in height.
- (7) Thermocouples shall be installed during pile buildup, or other means for measuring temperatures within the pile shall be provided with regular (normally weekly) reports to management.
- (8) The quality of chip supplies shall be controlled in terms of percentage of fines.
- (9) The concentration of fines shall not be allowed during pile buildup.
- (10)\* Pneumatic systems produce an air classification of stored materials that shall be recognized, and appropriate steps shall be taken to minimize concentration of fines.
- (11)\* The pile shall be wetted regularly to help keep fines from drying out and help maintain the moisture content of the surface layer of the pile.
- (12) Vehicles used on all piles shall be of a type that minimizes compaction.

#### 11.5.3 Pile Protection.

**11.5.3.1** Piles shall be constructed with an access roadway to the top of the pile in order to reach any part of the pile.

**11.5.3.2** For very large piles, two or more access roadways shall be provided on opposite sides of the pile.

**11.5.3.3\*** Piles shall not exceed 60 ft (18.3 m) in height, 300 ft (91.4 m) in width, and 500 ft (152.4 m) in length.

- (A) Where pile height and width are such that all portions of the pile cannot be reached by direct hose streams from the ground, arrangements shall be made to provide fire-fighting service in these areas, and small fire stream supplies shall be available on the top of the pile for handling small surface fires and for wetting the pile in dry weather.

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(B) When piles exceed 500 ft (152.4 m) in length, they shall be subdivided by fire lanes having at least 30 ft (9.1 m) of clear space at the base of the piles.

(C) Low barrier walls around piles shall be provided to clearly define pile perimeters, prevent creeping, and facilitate cleanup of fire lanes.

**11.5.3.4** Where suitable, a small, motorized vehicle amply equipped with portable extinguishing equipment or a water tank and pump shall be provided.

(A) Lightweight ladders that can be placed against the side of the pile shall be placed at convenient locations throughout the yard for use by the plant emergency organization.

(B) Training of the plant emergency organization also shall include procedures and precautions to be observed by yard crews employing power equipment in fighting internal fires.

**11.5.3.5\*** Portable fire extinguishers suitable for Class A fires shall be provided in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, on all vehicles operating on the pile in addition to the normal Class B units for the vehicle.

**11.5.3.6\*** Water supplies shall be provided in accordance with NFPA 1, *Fire Prevention Code*.

**11.5.3.7\*** Standard automatic sprinkler protection shall be provided as follows:

- (1) In all tunnels and enclosures under the pile.
- (2) In all other handling and conveyor installations of combustible construction or elevated installations of noncombustible construction that are hood-enclosed

**11.5.3.8** All motor and switch gear enclosures shall be provided with approved, suitable portable fire extinguishers suitable for the hazard involved in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

**11.5.3.9\*** Power-operated, shovel-type or scoop-type vehicles, dozers, or similar equipment shall be available for use in moving stored material for fire fighting.

**11.5.3.10** Temporary conveyors and motors on the surface or adjacent to the piles shall not be permitted.

**11.5.3.11** Physical protection shall be provided to prevent heat sources such as steam lines, air lines, electrical motors, and mechanical drive equipment from becoming buried or heavily coated with combustible material.

**11.5.3.12** A high standard of housekeeping shall be maintained around all potential heat sources.

**11.5.3.13** Care shall be exercised to prevent tramp metal from entering the piles, or sections of blower pipes from being buried in the piles.

**11.5.3.14** Tramp metal collectors or detectors, shall be required on all conveyor and blower systems.

### 11.5.4 Exposure Protection.

**11.5.4.1\*** Incinerators or open refuse burning shall not be permitted in any area where sparks could reach the storage piles.

**11.5.4.2\*** A clear space shall be maintained between piles and exposing structures, yard equipment, or stock, depending on the degree of exposure hazard.

**11.5.4.3\*** Pile-to-pile clearance of at least 30 ft (9.1 m) at the base of the pile shall be provided.

### 11.6 Outside Storage of Logs.

#### 11.6.1 Application.

**11.6.1.1\*** The provisions of Section 11.6 shall be to provide minimum fire protection standards to minimize the fire hazard in log yard storage areas containing saw, plywood, or pulpwood logs stored in ranked piles commonly referred to as cold decks.

Section 11.6 shall not apply to stacked piles of cordwood.

**11.6.1.2** In addition to the provisions contained in Section 11.6, the provisions outlined in Section 11-7 shall apply to all outside storage of logs, except as modified herein.

#### 11.6.2 General.

**11.6.2.1\*** The fire hazard potential inherent in log storage operations with large quantities of combustible materials be controlled by a positive fire prevention program under the direct supervision of upper level management that shall include the following:

(1) Selection, design, and arrangement of storage yard areas and materials-handling equipment based on sound fire prevention and protection principles

(2) Facilities for early fire detection, transmission of alarm, and fire extinguishment

(3) Fire lanes to separate large piles and provide access for effective fire-fighting operations

(4) Separation of yard storage from mill operations and other exposing properties

(5) Effective fire prevention maintenance program, including regular yard inspections by trained personnel

**11.6.2.2** Logs stored on piers or wharves shall be in accordance with NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*.

### 11.6.3 Log Yard Protection.

**11.6.3.1** The storage site shall be level, solid ground, paved or surfaced with material such as cinders, fine gravel, or stone.

**11.6.3.2** Refuse-filled or sawdust-filled land, swampy ground, or areas where the hazard of underground fire is present shall not be used as a storage site.

**11.6.3.3** Access to the plant and yard from public highways shall be provided by all-weather roadways capable of supporting fire department apparatus.

**11.6.3.4\*** All sides of each cold deck shall be accessible by means of fire lanes.

(A) A fire lane width of 1 1/2 times the pile height but not less than 20 ft (6.1 m) shall be provided, with fire lanes between alternate rows of two pile groups providing a clear space of at least 100 ft (30.5 m).

(B) Each cold deck shall not exceed 500 ft (152.4 m) in length, 300 ft (91.4 m) in width, and 20 ft (6.1 m) in height.

(C) Fire lanes for access across each end, with a clear space of at least 100 ft (30.5 m) to adjacent pile rows or other exposed property, shall be provided. (See *Figure 11-6.3.4*.)

(D) The size of cold decks shall be permitted to be increased where additional fire flow and fixed fire protection equipment is provided and the approval of the authority having jurisdiction is obtained.

**Figure 11-6.3.4** Layout of log storage yard.

**11.6.3.5\*** Water Supplies shall be provided in accordance with NFPA 1, *Fire Prevention Code*.

**11.6.3.6** Dynamite shall never be used as a means to reclaim frozen log piles.

**11.6.3.7\*** During dry weather, piles shall be wet down.

**11.6.3.8\*** Pile height shall be limited to 20 ft (6.1 m).

### 11.7 General Fire Protection.

**11.7.1 Application.** The provisions contained in Section 11.7 shall apply to all facilities in Sections 11.2 through Section 11.6.

#### 11.7.2 Operational Fire Prevention.

**11.7.2.1** Weeds, grass, and similar vegetation shall be prevented throughout the entire yard, and any vegetation growth shall be sprayed and often as needed with a herbicide or ground sterilizer, or shall be grubbed out.

(A) Dead weeds shall be removed after destruction.

(B) Weed burners shall not be used.

**11.7.2.2\*** Combustible waste materials such as bark, sawdust, chips, and other debris shall not be permitted to accumulate in a quantity or location that constitutes an undue fire hazard.

**11.7.2.3** Smoking shall be prohibited except in specified safe locations, approved by the authority having jurisdiction. Signs that read "no smoking" shall be posted in those areas where smoking is prohibited, and signs indicating areas designated as safe for smoking shall be posted in those locations.

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(A) Smoking areas shall be provided with approved, noncombustible ash receptacles.

(B) Smoking shall be specifically prohibited in and around railroad cars.

**11.7.2.4** Access into yard areas by unauthorized persons shall be prohibited.

**11.7.2.5** Storage areas shall be enclosed with a suitable fence equipped with proper gates located as necessary to allow the entry of fire department apparatus.

**11.7.2.6** Miscellaneous occupancy hazards such as vehicle storage and repair shops, cutting and welding operations, flammable liquid storage, liquefied petroleum gas storage, and similar operations shall be safeguarded in accordance with recognized good practice.

**11.7.2.7** Reference shall be made to NFPA standards that apply to specific occupancy hazards.

**11.7.2.8** Vehicles and other power devices shall be of an approved type and shall be safely maintained and operated.

(A)\* Vehicle fueling operations shall be conducted in specified safe locations, isolated from storage areas and principle operating buildings.

(B) Diesel- or gasoline-fueled vehicles that operate on hogged material or chip piles, in log storage areas, or in lumber storage areas shall be equipped with fixed fire-extinguishing systems of a type approved for off-road vehicles.

**11.7.2.9** All electrical equipment and installations shall conform to the provisions of NFPA 70, *National Electrical Code*.

**11.7.2.10** Salamanders, braziers, open fires, and similar dangerous heating arrangements shall be prohibited.

**11.7.2.11** Heating devices shall be limited to approved-type equipment installed in an approved manner.

**11.7.2.12** Suitable safeguards shall be provided to minimize the hazard of sparks caused by equipment such as refuse burners, boiler stacks, vehicle exhausts, and locomotives.

(A)\* Burning of shavings, sawdust, and refuse materials shall be conducted only in an approved, enclosed refuse burner equipped with an approved spark arrester and located at a safe distance from the nearest point of any yard.

(B) The design and location of large burners presents special problems, and the authority having jurisdiction shall be consulted.

**11.7.2.13** Stacks from solid fuel-burning furnaces and boilers shall be equipped with spark-arresting equipment to prevent hot sparks from reaching the ground, and consideration shall be given to spark hazard in determining the height of such stacks.

**11.7.2.14\*** Solid fuel-fired steam locomotives, cranes, and similar equipment entering or operating in yards shall be equipped with heavy screening and hinged openings between the mud ring and the flare of the ash pan to prevent hot coals from dropping from the ash pan.

**11.7.2.15\*** It is recommended that front-end screens of coal-fired locomotives be examined at frequent intervals. Oil-fired steam equipment shall be provided with fully enclosed drip pans to prevent burning oil from escaping.

**11.7.2.16\*** If yard storage areas are located in regions highly susceptible to lightning strikes, consideration shall be given to the installation of lightning protection on masts or towers to provide area protection.

**11.7.2.17** Cutting, welding, or other use of open flames or spark-producing equipment shall not be permitted in the storage area unless by an approved permit system.

**11.7.3 Exposure Protection.** Exposure to the yard shall be protected in accordance with the requirements of 11.7.3.1 through 11.7.3.30.-

**11.7.3.1** Yard areas shall be separated from plant operations and other structures so that fire exposure into the yard is minimized.

Minimum separation should be by means of a clear space permanently available for fire-fighting operations.

The width of the clear space shall be based on the severity of exposure, which varies with the area, height, occupancy, construction, and protection of the exposing structure and the type of stacking and height of adjacent stacks

**11.7.3.2\*** Unsprinklered saw mills, planing mills, treating plants, adzing mills, and similar buildings without blank walls shall be separated from yard

storage by a clear space in accordance with the recommendations of NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*.

**11.7.3.3** Forest, brush, and grass fire exposure shall be minimized by providing adequate clear space that is carefully kept free of combustible vegetation.

(A) Clear space of a width at least equivalent to the fire lane shall be provided for grass exposures, and clear space of a width at least 100 ft (30.5 m) shall be provided for light brush exposures.

(B) In forested areas, a wider clear space shall be provided.

**11.7.4 Fire Detection and Extinguishment.**

**11.7.4.1** In storage yards, a reliable means for prompt transmission of fire alarms to public fire departments and plant emergency organizations shall be provided at convenient and accessible locations in the yard.

**11.7.4.2** Portable fire extinguishers suitable for the fire hazard involved shall be provided at convenient, conspicuously accessible locations in the yard.

(A)\* Approved portable fire-extinguishing equipment shall be located so that the maximum travel distance to the nearest unit does not exceed 75 ft (22.9 m).

(B) Approved fire extinguishers suitable for the fire hazard involved shall be provided on all power vehicles and units, including haulage or private locomotives in the yard.

**11.7.4.3** Water supplies shall be provided in accordance with NFPA 1, *Fire Prevention Code*.

### Chapter 12 Outdoor Storage of a Broad Range of Combustibles Excluding Scrap Tires and Forest Products (Reserved)

### Chapter 13 Storage of Scrap Tires (Reserved) Annex A

Note: The following does not represent the final version of Annex A. Unchanged material from the 1999 edition of NFPA 230 is not included here.

**A.3.2.1 Approved.** 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, 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 that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

**A.3.2.2 Authority Having Jurisdiction (AHJ).** The phrase "authority having jurisdiction" its acronym AHJ, 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, or 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 or her 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.

**A.3.2.4 Listed.** The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations 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.

**A.3.3.10 Chips.** Chips are usually 1/4 in. to 1 1/4 in. (6.4 mm to 31.8 mm) in size, with nothing finer than that which is retainable on a 1/4-in. (6.4-mm) screen; however, blower and conveyor systems can create some fine dust particles after screening.

**A.3.3.23 Encapsulated.** Totally noncombustible commodities on wood pallets that are enclosed only by a plastic sheet are not covered under this definition. Banding (that is, stretch-wrapping around only the sides of a pallet load) is not considered to be encapsulation. Where there are holes or voids in the plastic or waterproof cover on the top of the carton that exceed more than



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half the area of the cover, the term encapsulated does not apply. The term encapsulated does not apply to plastic-enclosed products or packages inside a large, nonplastic, enclosed container.

**A.3.3.37 Rack.** Some rack structures use solid shelves. Racks are permitted to be fixed, portable, or movable [see Figure A-5-3.1(a)(1) through Figure A-5-3.1(a)(4), Figure A-5-3.1(b), Figure A-5-3.1(c)(1) through Figure A-5-3.1(c)(4), Figure A-5-3.1(d), and Figure A-5-3.1(f)]. Loading is permitted to be either manual, using lift trucks, stacker cranes, or hand placement, or automatic, using machine-controlled storage and retrieval systems.

**A.3.3.37.2 Movable Rack.** Movable racks can be moved back and forth only in a horizontal, two-dimensional plane. A moving aisle is created as abutting racks are either loaded or unloaded, then moved across the aisle to abut other racks.

**A.3.3.37.4 Portable Rack.** Portable racks can be arranged in any number of configurations.

**A.3.3.40.7 Miscellaneous Storage.** Miscellaneous storage is defined in NFPA 13, *Standard for the Installation of Sprinkler Systems*. Such storage is not permitted to constitute more than 10 percent of the building area or 4000 ft<sup>2</sup> (372 m<sup>2</sup>) of the sprinklered area, whichever is greater. Such storage is not permitted to exceed 1000 ft<sup>2</sup> (93 m<sup>2</sup>) in one pile or area, and each such pile or area is to be separated from other storage areas by at least 25 ft (7.6 m).

**A.3.3.40.8 Miscellaneous Tire Storage.** See Chapter 5 of NFPA 13, *Standard for the Installation of Sprinkler System*, for definitions of occupancy use groups.

**A.11.1.1** Each individual property has its own special conditions of stock-handling, exposure, and topography. For this reason, only basic fire protection principles are discussed herein and are intended to be applied with due consideration of all local factors involved. The authority having jurisdiction should be consulted.

**A.11.2.1.3** The type of operations at properties where the provision of Section 11.3 apply vary widely. Retail lumber and building material operations are often characterized by large area buildings with minor outside storage areas. On the other hand, wholesale and distribution yards can involve large outside storage areas that present fire protection problems similar to mill yards.

**A.11.2.2.1** Fire loss experience in lumberyards indicates that the following are the principal factors that allow lumberyard fires to reach serious proportions:

- (1) Large, undivided stacks,
- (2) Congested storage conditions
- (3) Delayed fire detection
- (4) Inadequate fire protection
- (5) Ineffective fire-fighting tactics

**A.11.2.2.3** It is recognized that retail and wholesale lumber storage yards are normally located within municipal system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/s) minimum]. Where large-scale fire-fighting operations can be expected, larger water supplies are needed. Where protection from municipal water supplies and hydrant systems is not provided or is not considered adequate by the authority having jurisdiction, a yard fire hydrant system should be provided and installed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

**A.11.2.3.3** It is recognized that some materials are stored on pallets in an open yard. Since stacks of empty pallets present a severe fire problem, special attention needs to be paid to the storage arrangements of empty pallets.

**A.11.2.3.4** Air-dried stickered stacks are subject to rapid fire spread through the air spaces and should therefore be kept as low as practicable.

**A.11.2.4.1** Automatic sprinklers provide an efficient means of fire detection and extinguishment. Automatic sprinkler protection should be considered for all large storage buildings containing combustible contents and auxiliary buildings containing hazardous operations that can constitute an exposure to outside lumber storage or other property.

**A.11.2.5.1** Many retail lumberyards sell clay, concrete, and stone products. If present, such products should or are to be arranged to create a fire barrier between the yard and adjacent properties or buildings.

**A.11.2.5.2.2** Sufficient fire resistance capability should or is to be determined through compliance with NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*.

**A.11.2.5.2.3** Examples of operations are (woodworking, glazing, painting, dry kilns, auto repairing, grain or feed milling or grinding, aboveground fuel or gasoline tanks)

**A.11.2.5.3** Because of the large quantities of material generally involved in lumberyard fires, some form of exposure protection for adjoining properties is recommended. Clear spaces or walls capable of providing fire barriers between yard storage and the exposed properties should be used. The responsibility for the proper protection of properties adjoining a lumberyard is often a joint responsibility to be worked out between of the lumberyard and adjoining property owners. The authority having jurisdiction should be consulted.

**A.11.3.1.1** Each individual property has its own special conditions of yard use, material-handling methods, and topography. For this reason, only basic fire protection principles are discussed herein, and are intended to be applied with due consideration of all local factors involved. The authority having jurisdiction should be consulted.

**A.11.3.2.1** Fire loss experience in lumber storage yards indicates that the following are the principle factors that allow lumberyard fires to reach serious proportions.

- (1) Large undivided stacks,
- (2) Congested storage conditions,
- (3) Delayed fire detection,
- (4) Inadequate fire protection,
- (5) Ineffective fire-fighting tactics.

**A.11.3.2.1(2)** See NFPA 72, *National Fire Alarm Code*.

- (3) Fire lanes to separate large stacks and provide access for effective fire-fighting operations
- (4) Separation of yard storage from mill operations and other exposing properties
- (5) Effective fire prevention maintenance program, including regular yard inspections by trained personnel

**A.11.3.3.1** For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/s) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

Where large-scale fire-fighting operations can be expected, larger water supplies with adequate mains are needed.

For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached to allow rapid hose laying to all parts of the stacking areas. For this reason, the hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61.0 m) of hose. Hydrants preferably should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61.0 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 1995 edition.)

**A.11.4.1.1** Each individual property has its own special conditions of yard use, stock-handling methods, and topography. For this reason, only basic fire protection principles are discussed herein, and are intended to be applied with due consideration of all local factors involved. Ties, as used herein, include ties, poles, piles, posts, and other similar forest products. Treated ties are ties that are pressure impregnated with preservatives.

**A.11.4.2** Fire loss experience in tie storage yards indicates that the following are the principle factors that allow fires to reach serious proportions:

- (1) Large undivided stacks,
- (2) Congested storage conditions,
- (3) Delayed fire detection,
- (4) Inadequate fire protection,
- (5) Ineffective fire-fighting tactics.

**A.11.4.3.1** With relatively open stacking (that is stacking that allows penetration of fire-extinguishing streams) sufficient alleyway width can usually be accomplished by providing a 4-ft (1.2-m) or greater alleyway width between alternate rows of tie stacks [see Figure A.11-4.3.1(a)]. Flat crib-style stacking without space between stacks that forms solid packed rows would require a 4-ft (1.2-m) or greater alleyway width between each row. Where the stacking area does not allow a 4-ft (1.2-m) or wider alleyway between each such row, the length of the rows (distance between fire lanes) should be held to 75 ft (22.9 m) or less. In no case should such alleyways be reduced to less than 2 ft (0.6 m) in width [see Figure A.11-4.3.1(b)].

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### Figure A.11-4.3.1(a) Relatively open stacking methods.

### Figure A.11-4.3.1(b) Crib style stacking into solid rows.

**A.11.4.3.2** For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/s) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

Where large-scale fire-fighting operations can be expected, larger water supplies with adequate mains are needed.

For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached to allow rapid hose laying to all parts of the stacking areas. For this reason, hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61 m) of hose. Hydrants preferably should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 13, *Standard for the Installation of Sprinkler Systems*.)

**A.11.4.3.6** Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations.

**A.11.5.1.1** Each individual property has its own special conditions of yard use, stock-handling methods, and topography. It is recognized that climate conditions, wood species, and the age of piles are all factors affecting fire safety. For these reasons, only basic fire protection principles are discussed herein, and are intended to be applied with due consideration of all local factors involved. Except for the surface layer, the moisture content of a pile of wood chips or hogged material is quite high, so surface fires do not generally penetrate more than a few inches into the pile. Fire tests indicate that, for areas of average humidity conditions, the flame propagation over the surface is relatively slow. These conditions allow ready extinguishment, provided that there is early detection and good access. It is expected that, in areas where long periods of low humidity prevail, faster surface flame spread can be anticipated, increasing the importance of early detection and good access.

**A.11.5.2.1** Fire experience and fire tests indicate that two completely different types of fires can occur in storage piles – surface fires and internal fires. Fire prevention activities and fire protection facilities should, therefore, include preparations for coping with both situations. Internal heating is a hazard inherent to long-term bulk storage of chips and hogged material that progresses to spontaneous combustion under certain pile conditions. Internal fires are difficult to detect and extinguish. Unless provisions are made for measuring internal temperatures, such fires can burn for long periods before emission of smoke at the surface indicates an internal fire. Extinguishment then becomes a lengthy and expensive loss-control and operating problem requiring equipment and manpower to move large portions of the pile, either by digging out the burning portions or removing the unburned portions of the pile. Experience has shown that these conditions create very large losses, and special attention should be given to the prevention of spontaneous combustion and to pre-fire planning where evaluating how best to handle an imminent or actual fire in a particular pile.

**A.11.5.2.2(4)** For example whole-tree chip piles containing bark, leaves, and other extraneous or hogged material can be subject to greater degrees of spontaneous heating and thermal degradation shall be reclaimed more frequently.

**A.11.5.2.2(5)** Fundamentally, several small piles are better than one large pile.

**A.11.5.2.2(10)** It is preferable to spread new stored materials in a relatively even layer over the pile.

**A.11.5.2.2(11)** It is important to minimize the diffusion of water from wet, stored material into dry fires to reduce exothermic heating caused by sorption effects. It is also important to maintain surface moisture content so as to reduce the hazard of surface fires during periods of hot, dry weather.

**A.11.5.2.2** Prevention of internal fires requires an understanding of the factors that cause exothermic oxidation so that steps can be taken to minimize this hazard and to provide means of monitoring temperature conditions inside the pile.

**A.11.5.3.3** Narrow, low piles facilitate fire extinguishment.

**A.11.5.3.5\*** Due to the size and configuration of piles, it is not practical to provide portable fire extinguishers within 75 ft (22.9 m) of travel distance to any point.

**A.11.5.3.6** Fire hydrants connected to yard mains should be provided so that any part of the pile(s) can be reached by hose equipment provided in each

hydrant hose house. Each hydrant hose house should be equipped with a complement of 2 1/2-in. (63.5-mm) and 1 1/2-in. (38.1-mm) hose, a 2 1/2-in. (63.5-mm) and 1 1/2-in. (38.1-mm) gated wye, and 1 1/2-in. (38.1-mm) combination nozzles.

Hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61 m) of hose.

Where pile configurations are such that all parts of the pile cannot be reached by the hose, a fire hose cart(s) equipped with an ample supply of hose and nozzles should be strategically placed in the storage area. The amount of water needed to control a pile fire varies substantially depending on the size of the pile. Weather conditions, operating methods, geographic location, type of material stored, and the degree to which wetting can be employed affect the potential for a large area surface fire. Experience indicates that exposure to long periods of hot, dry weather with no regular surface wetting creates conditions under which fast-spreading surface fires, which require many hose streams for control depending on the size of the pile, can occur. Likewise, the frequency of pile turnover and operating methods affect the potential for serious internal fires. Piles built using methods that allow a concentration of fines and piles stored for long periods of time with no turnover are subject to internal heating that, if undetected, can create intense internal fires.

A minimum flow of 500 gpm (31.5 L/s) should be provided at any fire hydrant in the pile area.

Additional flows should be provided as needed where conditions are likely to produce serious surface fires or large internal fires. Fire mains should be engineered to deliver the recommended gallonage plus allowance for operational uses and special extinguishing equipment at a residual pressure of 60 psi to 100 psi (413.7 kPa to 689.5 kPa) at the hydrants.

**A.11.5.3.7** Automatic sprinklers are needed in the above areas specified in 11.5.3.7 due to the difficulty of hand fire fighting in concealed, enclosed, or elevated areas.

**A.11.5.3.9** With the use of the equipment specified in 11.5.3.9, surface types of pile fires can usually be removed from the affected areas and extinguished.

Where deep-seated fires occur within the pile or under the pile in tunnels or other enclosures, this equipment is invaluable in breaking down the entire pile and spreading it out in a safe yard area, which allows fire fighters using hand hose lines or deluge units to extinguish both the pile and ground-spread stored material.

**A.11.5.4.1** Experience indicates that radiated heat from exposing fires in storage piles does not ordinarily pose a serious ignition threat to other piles, provided that recommended clear spaces are maintained. Flying brands from exposing fires, especially during high winds, do present a hazardous ignition source. Upwind forest or brush fires can also present a problem in relation to flying sparks and brands.

**A.11.5.4.2** Buildings or other structures near storage piles can pose a serious exposure hazard to the pile.

**A.11.5.4.3** Greater clearance is desirable when piles are high and side slopes are greater than 60 degrees.

**A.11.6.1.1** Each individual property has its own special conditions for yard use, stock-handling methods, and topography. For this reason, only basic fire protection principles are discussed herein, and are intended to be applied with due consideration of all local factors involved.

**A.11.6.2.1** Fire loss experience in outside storage of logs indicates that the following are the principle factors that allow log pile fires to reach serious proportions:

- (1) Large undivided piles,
- (2) Congested storage conditions,
- (3) Delayed fire detection,
- (4) Inadequate fire protection
- (5) Ineffective fire-fighting tactics

**A.11.6.3.4** Where practical, greater widths should be provided to minimize the effects of radiated heat, particularly in high-piled yards.

**A.11.6.3.5** For basic fire protection, the hydrant system should be capable of supplying at least four 2 1/2-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/s) minimum] while maintaining a positive residual pressure in the fire protection hydrant system of at least 20 psi (138 kPa).

Where large-scale fire-fighting operations can be expected, larger water supplies with adequate mains are needed.

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For early extinguishment with basic fire protection, hydrants should be spaced with sufficient 2 1/2-in. (63.5-mm) hose attached to allow rapid hose laying to all parts of the piling areas. For this reason, hydrants should be spaced at about 250-ft (76.2-m) intervals so that any part of the yard can be reached with 200 ft (61 m) of hose. Hydrants should be located at fire lane intersections. A hydrant hose house with at least 200 ft (61 m) of fire hose and auxiliary equipment should be provided at each hydrant. (See NFPA 13, *Standard for the Installation of Sprinkler Systems*).

**A.11.6.3.7** The installation of a portable piping system equipped with irrigation or lawn-type sprinklers on the top of each log pile is recommended.

**A.11.6.3.8** Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations, since successful extinguishment of log pile fires requires penetration of the pile from the side by hose streams.

**A.11.7.2.2** Good housekeeping should be maintained at all times, including regular and frequent cleaning of materials-handling equipment.

**A.11.7.2.8(A)** See NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation*.

**A.11.7.2.12(A)** See NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, for small rubbish burners.

**A.11.7.2.15** It is recommended that diesel locomotives be equipped with approved spark arresters or other devices to prevent the escape of glowing carbon particles from the exhausts.

**A.11.7.2.16** See NFPA 780, *Standard for the Installation of Lightning Protection Systems*.

**A.11.7.3. 2** Unsprinklered manufacturing buildings and other large structures with combustible contents represent a severe exposure to yard storage, unless the exterior walls have the necessary fire resistance to act as a fire separation and are essentially absent of unprotected openings.

**A.11.7.4.2(A)** See NFPA 10, *Standard for Portable Fire Extinguishers*.