

# NFPA 46

## Storage of Forest Products 1985



## **NOTICE**

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

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

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

Users of this document should consult applicable Federal, State and local laws and regulations. NFPA does not, by the publication of this document, intend to urge action which is not in compliance with applicable laws and this document may not be construed as doing so.

### **Policy Adopted by NFPA Board of Directors on December 3, 1982**

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

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

---

### **Licensing Provision**

This document is copyrighted by the National Fire Protection Association (NFPA). Public authorities and others are urged to reference this document in laws, ordinances, regulations and administrative orders or similar instruments. Any deletions, additions, and changes desired by the adopting authority must be noted separately. Those using this method ("adoption by reference") are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use.

The term "adoption by reference" means the citing of the title and publishing information only.

(For further explanation, see the Policy Concerning the Adoption, Printing and Publication of NFPA Documents which is available upon request from the NFPA.)

---

### **Statement on NFPA Procedures**

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

NFPA has no power or authority to police or enforce compliance with the contents of this document and any certification of products stating compliance with requirements of this document is made at the peril of the certifier.

© 1985 NFPA, All Rights Reserved

**NFPA 46**  
**Recommended Safe Practice for**  
**Storage of Forest Products**

**1985 Edition**

This edition of NFPA 46, *Recommended Safe Practice for Storage of Forest Products*, was prepared by the Technical Committee on Storage of Forest Products, released by the Correlating Committee on Storage, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 12-15, 1984 in San Diego, California. It was issued by the Standards Council on December 7, 1984, with an effective date of December 27, 1984, and supersedes all previous editions.

The 1985 edition of this standard has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

**Origin and Development of NFPA 46**

This document incorporates the subjects formerly covered in four separate documents: NFPA 46, *Outdoor Storage of Forest Products*; NFPA 46A, *Outdoor Storage of Wood Chips*; NFPA 46B, *Outside Storage of Logs*; and NFPA 47, *Retail and Wholesale Lumber Storage Yards*.

NFPA 46 was in two parts: Part I was first adopted in 1969; Part II was tentatively adopted in 1959 and officially adopted in 1961. The document was revised in 1973.

NFPA 46A was tentatively adopted in 1964 and officially adopted without change in 1965. It was revised in 1973.

NFPA 46B was tentatively adopted in 1969 and officially adopted in 1971. It was revised in 1976.

NFPA 47 was first adopted in 1951, and revised in 1961 and 1973.

The 1978 edition superseded the 1973 edition of NFPA 46, the 1973 edition of NFPA 46A, the 1976 edition of NFPA 46B, and the 1973 edition of NFPA 47. This edition is a partial revision to the 1978 edition and includes references to "hogged material."

## Committee on Storage Correlating Committee

**Robert G. Planer, *Chairman***  
Johnson & Higgins

**Lydia A. Butterworth, *Secretary***  
National Fire Protection Association  
(Nonvoting)

**J. S. Barritt**, Industrial Risk Insurers  
**Thomas E. Goonan**, Schirmer Engineering Corp.  
**Edward Jefferson**, UniRoyal Inc.

**W. P. Thomas Jr.**, Kemper Group  
**C. R. Thomson**, Canadian Wood Council

### Nonvoting

**Wesley L. D. Chisholm**, Liberty Mutual Insurance Co.  
Rep. NFPA Comm. on Motor Vehicle & Highway Fire Protection

**R. A. Pedersen**, Washington Surveying & Rating Bureau  
Rep. NFPA Comm. on Marine Terminals

## Technical Committee on Storage of Forest Products

**C. R. Thomson, *Chairman***  
Canadian Wood Council

**Richard L. Astolfi**, Weyerhaeuser Co.  
**G. Beach**, Reed Shaw Stenhouse  
**Wm. George Clark**, MacMillan Bloedel Ltd.  
**Robert C. Everson**, Berkeley Heights, NJ  
**Michael N. Matzko**, Natl. Homes Corp.  
Rep. NFPA Industrial Fire Protection Section

**Peter J. Murphy**, Champion Intl.  
**Walter J. Orey**, St. Regis Paper Co.  
**R. A. Pedersen**, Washington Surveying & Rating Bureau  
**Kenneth R. Peterson**, Georgia-Pacific Corp

### Alternates

**John A. Antola**, St. Regis Paper Co.  
(Alternate to W. J. Orey)  
**Arthur F. Muschler**, Edward Hines Lumber Co.  
(Alternate to Nat'l. Lumber and Building Materials Dealers Asso. Rep.)

**A. Des Yawn**, M&M Protection Consultants  
(Alternate to M&M Protection Consultants Rep.)

*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*

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

## Contents

|  |              |
|--|--------------|
| <b>Chapter 1 General</b> .....   | <b>46- 4</b> |
| 1-1 Purpose .....  | 46- 4        |
| 1-2 Scope .....  | 46- 4        |
| <b>Chapter 2 Definitions</b> .....   | <b>46- 4</b> |
| <b>Chapter 3 Retail and Wholesale Lumber Storage Yards</b> .....   | <b>46- 4</b> |
| 3-1 Application .....  | 46- 4        |
| 3-2 General .....  | 46- 5        |
| 3-3 Open Yard Storage .....  | 46- 5        |
| 3-4 Buildings .....  | 46- 5        |
| 3-5 Exposure Protection .....  | 46- 5        |
| 3-6 Special Fire Prevention .....  | 46- 6        |
| <b>Chapter 4 Outside Storage of Lumber at Other than Retail or Wholesale Yards</b> .....   | <b>46- 6</b> |
| 4-1 Application .....  | 46- 6        |
| 4-2 General .....  | 46- 6        |
| 4-3 Basic Lumberyard Protection .....  | 46- 6        |
| 4-4 Special Lumberyard Protection .....  | 46- 6        |
| <b>Chapter 5 Outside Storage of Ties, Poles, Piles, Posts and Other Similar Forest Products at Pressure Treating Plant Yards</b> ..... | <b>46- 7</b> |
| 5-1 Application .....  | 46- 7        |
| 5-2 General .....  | 46- 7        |
| 5-3 Basic Tie Yard Protection .....  | 46- 7        |
| 5-4 Special Tie Yard Protection .....  | 46- 8        |
| <b>Chapter 6 Outside Storage of Wood Chips and Hogged Material</b> .....   | <b>46- 8</b> |
| 6-1 Application .....  | 46- 8        |
| 6-2 General .....  | 46- 9        |
| 6-3 Pile Protection .....  | 46- 9        |
| 6-4 Exposure Protection .....  | 46-10        |
| <b>Chapter 7 Outside Storage of Logs</b> .....   | <b>46-11</b> |
| 7-1 Application .....  | 46-11        |
| 7-2 General .....  | 46-11        |
| 7-3 Basic Log Yard Protection .....  | 46-11        |
| 7-4 Special Log Yard Protection .....  | 46-12        |
| <b>Chapter 8 General Fire Protection</b> .....   | <b>46-12</b> |
| 8-1 Application .....  | 46-12        |
| 8-2 Operational Fire Prevention .....  | 46-12        |
| 8-3 Exposure Protection .....  | 46-13        |
| 8-4 Fire Detection and Extinguishment .....  | 46-13        |
| <b>Chapter 9 Referenced Publications</b> .....   | <b>46-14</b> |

**NFPA 46****Recommended Safe Practice for  
Storage of Forest Products****1985 Edition****Chapter 1 General**

**1-1 Purpose.** The intent of these recommendations is to provide fire protection guidance to minimize the fire hazard in areas used for the storage of forest products, particularly as they are stored outside buildings. These recommendations 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 recommended 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.

**1-2 Scope.** These recommendations cover: retail and wholesale lumber storage yards; outside storage of lumber and timber at other than retail or wholesale yards; outside storage of ties, poles, piles, posts and other similar forest products at pressure treating plant yards; outside storage of wood chips; outside storage of logs; and outside storage of hogged material.

**Chapter 2 Definitions**

**2-1** Unless expressly stated elsewhere, the following terms will, for the purpose of this recommended practice, have the meanings indicated below.

**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.

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

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

**Chips.** Wood chips of various species used in the manufacture of pulp. These chips are usually ¼ in. (6.4 mm) to 1¼ in. (31.8 mm) in size, with nothing finer than what is retainable on a ¼-in. (6.4-mm) screen; however, blower and conveyor systems may create some fine dust particles after screening.

**Clear Space.** Any area free of combustible materials. This does not preclude the storage of noncombustible materials that will not transmit an exposure fire.

**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) in length.

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

**Cunit.** 100 cu ft (2.8 m³) of solid wood or 100 cu ft (2.8 m³) of chips or hogged material.

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

**Hogged Material.** Mill waste consisting mainly of hogged bark but may include mixture of bark, chips, dust or other byproduct from trees. This also includes material designated "hogged fuel."

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

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

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

**Stacked Piles.** Piles of logs where logs are generally conveyed to the center of a pile presenting a cone shaped appearance.

**Yard.** The outdoor areas where lumber, wood chips, logs, and other wood products are stored outside buildings.

**Chapter 3 Retail and Wholesale****Lumber Storage Yards****3-1 Application.**

**3-1.1** The intent of the recommendations contained in this chapter is to provide fire protection guidance to minimize the fire hazard in (a) retail lumberyards handling forest products and other building materials, (b) wholesale lumber storage yards including distribution, holding, and transshipment areas, and (c) buildings in retail and wholesale lumberyards used for storage of forest products or auxiliary operations.

**3-1.2** In addition to the recommendations contained in this chapter, the provisions outlined in Chapter 8, "General Fire Protection," should apply to all retail and wholesale lumber storage yards except as modified herein.

NOTE: The type of operations at properties to which these recommendations apply will be found to 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 may involve large outside storage areas, which present fire protection problems similar to mill yards. The principles outlined in Chapter 4, "Outside Storage of Lumber at Other than Retail or Wholesale Yards," should be used as a further guide for large outside storage areas and the authority having jurisdiction should be consulted in all cases.

### 3-2 General.

**3-2.1** 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 material can best be controlled by a positive fire prevention program under the direct supervision of top management and should include:

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

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

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

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

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

**3-2.2** Special problems of construction and protection are involved with cargo yards having lumber stored on piers or wharves and lumber stored on raised platforms. NFPA 87, *Standard for the Construction and Protection of Piers and Wharves*, and the authority having jurisdiction should be consulted in each case.

**3-2.3** 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 2½-in. (63.5-mm) hose streams simultaneously [1000 gpm (63 L/sec) minimum]. Where large-scale fire fighting operations may 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.

### 3-3 Open Yard Storage.

**3-3.1** Lumber stacks should be on solid ground, preferably paved or surfaced with materials such as cinders, fine gravel or stone. Refuse- or sawdust-filled land, where the danger of underground fire is present, should not be used.

**3-3.2** Method of stacking should be solid wherever possible and in an orderly and regular manner.

**3-3.3** It is recognized that some materials will be stored on pallets. As stacks of empty pallets present a severe fire problem, it is recommended that empty pallets be stored at least 50 ft (15.2 m) from buildings and that stack heights be limited to 8 ft (2.4 m).

**3-3.4** Height of stacks should not be over 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 practical.

**3-3.5** Where stacks are supported clear of the ground, adequate clearance should be provided for cleaning operations under the stacks.

**3-3.6** Driveways should be so spaced that a maximum grid system of not over 50 ft by 150 ft (15.2 m × 45.7 m) is produced.

**3-3.7** Driveways should have a minimum width of 15 ft (4.6 m) and an all-weather surface capable of supporting fire department apparatus.

**3-3.8** Boundary posts with signs designating stacking limits should be provided to indicate yard area and alley limits, where the yard has earth or crushed stone drives. In paved yard areas, painted boundary limits can be used instead of posts and signs.

### 3-4 Buildings.

**3-4.1** Automatic sprinklers provide an efficient means of fire detection and extinguishment. Automatic sprinkler protection is therefore recommended for all large storage buildings containing combustible contents and auxiliary buildings containing hazardous operations that may constitute an exposure to outside lumber storage or other property. The authority having jurisdiction should be consulted for requirements pertaining to automatic sprinkler installations. (*See NFPA 13, Standard for the Installation of Sprinkler Systems.*)

**3-4.2** Where automatic sprinklers are not installed, large storage buildings should be subdivided by fire walls into compartments not exceeding area limits specified in generally accepted model building codes.

### 3-5 Exposure Protection.

**3-5.1** Many retail lumberyards sell clay, concrete, and stone products. It is recommended that these and other least burnable materials (large size timbers and flat-stacked stock) be stored or stacked on the perimeter of the yard to act as a barrier between the yard and adjacent properties or buildings.

#### 3-5.2 Exposure to the Yard.

**3-5.2.1** Except as noted in 3-5.2.2, open yard stacking should be located with as much clear space to buildings as practicable. Building walls should have sufficient fire resistance to contain a fire that originates in the building, and windows or other openings should be reduced in size or adequately blocked to prevent radiant heat exposure to the open yard stacking. (*See 8-3.1.*)

**3-5.2.2** Unsprinklered buildings containing hazardous manufacturing or other operations — such as woodworking, glazing, painting, dry kilns, auto repairing, grain or feed milling or grinding, aboveground fuel or gasoline tanks, etc. — should have at least 50 ft (15.2 m) clear space to the nearest lumber stack, shed or warehouse. Boundary posts with signs designating stacking limits should be provided to designate clear space to the aforementioned buildings, tanks, etc.

### 3-5.3 Exposure from the Yard.

**3-5.3.1** 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.

### 3-6 Special Fire Prevention.

**3-6.1** All power woodworking machines, except for portable units, should be equipped with refuse removal equipment conforming to NFPA 91, *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying*.

**3-6.2** Materials such as hay, coal, grain and feed should be stored in separate buildings or in the open with adequate clear space between yard buildings or open yard storage.

## Chapter 4 Outside Storage of Lumber at Other than Retail or Wholesale Yards

### 4-1 Application.

**4-1.1** The intent of the recommendations contained in this chapter is to provide fire protection 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 recommended herein which are intended to be applied with due consideration of all local factors involved.

**4-1.2** In addition to the recommendations contained in this chapter, the provisions outlined in Chapter 8, "General Fire Protection," should apply to all large yard storage areas for lumber and timber at other than retail or wholesale yards except as modified herein.

### 4-2 General.

**4-2.1** 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 prin-

cipal 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 management and should include:

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

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

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

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

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

**4-2.2** Special problems of construction and protection are involved with cargo yards having lumber stored on piers or wharves and lumber stored on raised platforms. NFPA 87, *Standard for the Construction and Protection of Piers and Wharves*, and the authority having jurisdiction should be consulted in each case.

### 4-3 Basic Lumberyard Protection.

**4-3.1** For basic fire protection, the hydrant system should be capable of supplying at least four 2½-in. (63.5-mm) hose streams simultaneously [1,000 gpm (63 L/sec) minimum] while maintaining a positive residual pressure in the fire protection hydrant system.

NOTE: The usual practice of maintaining a minimum residual pressure of 20 psi (137.9 kPa) is recommended.

Where large-scale fire fighting operations may be expected, larger water supplies with adequate mains are needed. (See Section 4-4.)

For early extinguishment with basic fire protection, hydrants should be so spaced with sufficient 2½-in. (63.5-mm) hose attached to permit rapid hose laying to all parts of the stacking areas. For this reason, it is recommended that hydrants 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 should preferably 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*.)

**4-3.2** All-weather roadways capable of supporting fire department apparatus should be provided to the plant and yard from public highways.

**4-3.3** 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.

### 4-4 Special Lumberyard Protection.

**4-4.1** Yards consisting of single carrier loads of green flat-stacked lumber present a minimum hazard that gen-



erally requires only the basic protection provisions of Section 4-3 for 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 Section 4-3 for fire control, the following provisions are recommended as a guide. The relative importance of these provisions and the degree to which they may be needed will vary with yard conditions and the authority having jurisdiction should be consulted in all cases.

**4-4.2** Powerful water supplies and large mains should be provided where public or private fire department response, with manpower and equipment that can use these supplies, is available. Large stream equipment such as portable turrets and deluge sets requires 750 to 1000 gpm (47.3 to 63.1 L/sec) for each appliance. Monitor towers may require supplies in excess of 1000 gpm (63.1 L/sec) for each unit. In large yards where the hazard is severe, many of these devices may be operated simultaneously.

**4-4.3** 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) distant in any direction from access by motorized fire fighting equipment. Where special extinguishing equipment such as portable turrets, deluge sets and monitor towers are available, access distances may be governed by their effective reach with available water supplies. 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.

**4-4.4** 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.

## Chapter 5 Outside Storage of Ties, Poles, Posts and Other Similar Forest Products at Pressure Treating Plant Yards

### 5-1 Application.

**5-1.1** The intent of the recommendations contained in this chapter is to provide fire protection guidance 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 recommended herein which are intended to be applied with due consideration of all local factors involved.

**5-1.2** *Ties* as used herein includes ties, poles, piles, posts and other similar forest products. Treated ties are those pressure impregnated with preservatives.

**5-1.3** In addition to the recommendations contained in this chapter, the provisions outlined in Chapter 8, "General Fire Protection," 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.

### 5-2 General.

**5-2.1** 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 management and should include:

- (a) Selection, design and arrangement of storage yard areas and materials handling equipment based upon sound fire prevention and protection principles.
- (b) Facilities for early fire detection, transmission of alarm and fire extinguishment.
- (c) Fire lanes to separate large stacks and provide access for effective fire fighting operations.
- (d) Separation of yard storage from mill buildings and other exposing properties.
- (e) An effective fire prevention maintenance program, including regular yard inspections by trained personnel.

### 5-3 Basic Tie Yard Protection.

**5-3.1** Alleyways should be provided between piles, should be unobstructed, and of sufficient width for hand or cart fire hose laying operations. A minimum alleyway width of 4 ft (1.2 m) is recommended. Alleyways should be spaced so that effective action from initial fire fighting operations can be obtained. With relatively open stacking (stacking that will permit penetration of fire extinguishing streams) this can usually be accomplished by providing a 4-ft (1.2-m) or greater width alleyway between alternate rows of tie stacks [see Figure 5-3.1(a)]. Flat crib-style stacking without space between stacks so as to form solid packed rows would require a 4-ft (1.2-m) or greater width alleyway between each row. Where 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 5-3.1(b)].

**5-3.2** For basic fire protection, the hydrant system should be capable of supplying at least four 2½-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.

NOTE: The usual practice of maintaining a minimum residual pressure of 20 psi (137.9 kPa) is recommended.

Where large-scale fire fighting operations may be expected, larger water supplies with adequate mains are needed. (See Section 5-4.)

For early extinguishment with basic fire protection, hydrants should be so spaced with sufficient 2½-in. (63.5-mm) hose attached to permit rapid hose laying to all parts of the stacking areas. For this reason, it is recommended that hydrants 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 should preferably 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*.)

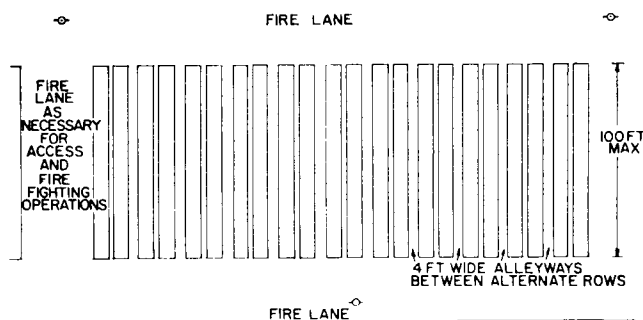


Figure 5-3.1(a) Relatively Open Stacking Methods.

SI Units: 1 ft = 0.30 m

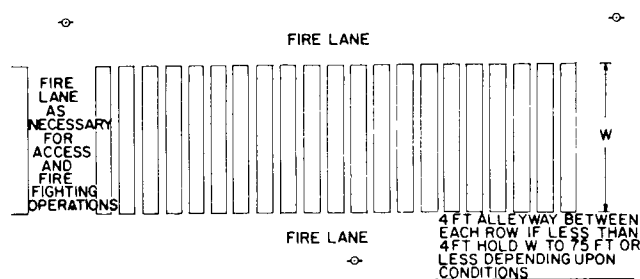


Figure 5-3.1(b) Crib Style Stacking into Solid Rows.

SI Units: 1 ft = 0.30 m

**5-3.3** All-weather roadways capable of supporting fire department apparatus should be provided to the plant and yard from public highways.

**5-3.4** 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.

#### 5-4 Special Tie Yard Protection.

**5-4.1** 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 Section 5-3 for fire control. High stacking over extensive areas, congested storage, and large amounts of treated tie storage present increased hazards which require additional safeguards and protection facilities. In yards requiring more than the basic protection provisions of Section 5-3 for fire con-

trol, the following provisions are recommended as a guide. The relative importance of these provisions and the degree to which they may be needed will vary with yard conditions and the authority having jurisdiction should be consulted in all cases.

**5-4.2** Powerful water supplies and large mains should be provided where public or private fire department response, with manpower and equipment that can use these supplies, is available. Large stream equipment such as portable turrets and deluge sets requires 750 to 1000 gpm (47.3 to 63.1 L/sec) for each appliance. Monitor towers may require supplies in excess of 1000 gpm (63.1 L/sec) for each unit. In large yards where the hazard is severe, many of these devices may be operated simultaneously.

**5-4.3** 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) distant in any direction from access by motorized fire fighting equipment. Where special extinguishing equipment such as portable turrets, deluge sets and monitor towers are available, access distances may be governed by their effective reach with available water supplies. 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.

**5-4.4** Stack heights should be limited. Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations.

**5-4.5** 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.

## Chapter 6 Outside Storage of Wood Chips and Hogged Material

### 6-1 Application.

**6-1.1** The intent of the recommendations contained in this chapter is to provide fire protection guidance 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 age of piles are all factors affecting fire safety. For these reasons, only basic fire protection principles are recommended herein which are intended to be applied with due consideration of all local factors involved.

**6-1.2** Since, except for the surface layer of the pile, the moisture content is quite high, 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 may be anticipated, increasing the importance of early detection and good access.

**6-1.3** In addition to the recommendations contained in this chapter, the provisions outlined in Chapter 8, "General Fire Protection," should apply to all outside storage of wood chips and hogged material except as modified herein.

## **6-2 General.**

**6-2.1** Fire experience and fire tests indicate that two completely different types of fires may occur in storage piles — surface fires and internal fires. Fire prevention activities and fire protection facilities should, therefore, be planned to cope with both situations. These programs should be under the direct supervision of top management and should include:

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

(b) Establishing control over the various factors that lead to spontaneous heating, including provisions for monitoring the internal condition of the pile.

(c) Facilities for early fire detection and extinguishment.

(d) Fire lanes around the piles and access roads to the top of the piles for effective fire fighting operations.

(e) Facilities for calling the public fire department and facilities needed by them for fire extinguishment.

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

**6-2.2** Internal heating is a hazard inherent to long-term bulk storage of chips and hogged material, which will progress to spontaneous combustion under certain pile conditions. Internal fires are difficult to detect and extinguish. Unless provision is made for measuring internal temperatures, such fires may 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 in digging out the burning portions, or removing the unburned portions of the pile. Experience has shown that these conditions create very large losses, demanding that special attention be given, first to the prevention of spontaneous combustion and, secondly, to prefire planning as how best to handle an imminent or actual fire in a particular pile.

**6-2.3** 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. Following are some of the important items that should be considered when establishing operating procedures:

- (a) Avoid all refuse and old chips in the chip pile base.
- (b) The storage site should be reasonably level solid

ground, or should 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 be based upon a maximum turnover time of one year under ideal conditions. Piles containing other than screened chips made from cleaned and barked logs (for example, whole-tree chip piles containing bark, leaves, and other extraneous materials or hogged material) may be subject to greater degrees of spontaneous heating and thermal degradation and should be reclaimed more frequently.

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

(e) Install thermocouples during pile buildup, or provide other means for measuring temperatures within the pile with regular (normally weekly) reports to management.

(f) Control quality of chip supplies in terms of percentage of fines.

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

(h) Wetting the pile regularly will help keep fines from drying out and help maintain moisture content of the surface layer of the pile. It is important to minimize the diffusion of water from wet stored material into dry fines to reduce exothermic heating caused by sorption effects, and 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 be of a type that minimizes compaction.

## **6-3 Pile Protection.**

**6-3.1** It is recommended that piles 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 on opposite sides of the piles are recommended. This applies only to storage in excess of 30 days.

**6-3.2** Narrow low piles facilitate fire extinguishment; therefore, piles should 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, arrangement should be made to provide service and small fire stream supplies readily 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 be subdivided by fire lanes having at least 30 ft (9.1 m) clear space at the base of the piles. Low barrier walls around piles are recommended to clearly define pile perimeters, prevent "creeping" and to facilitate cleanup of fire lanes.

**6-3.3** It is recommended that, where suitable, a small motorized vehicle amply equipped with portable extinguishing equipment or a water tank and pump be provided. Lightweight ladders that can be placed against the side of the pile should be provided at convenient locations throughout the yard for use by the plant emergency organization. Training of the plant emergency organization should also include procedures and precautions to be observed by yard crews employing power equipment in fighting internal fires. (See 8-4.6.)

**6-3.4** 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 be provided 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*.)

**6-3.5** Fire hydrants connected to yard mains should be provided so that any part of the pile(s) may be reached by hose equipment provided in each hydrant hose house. Each hydrant hose house should be equipped with a complement of 2½-in. (63.5-mm) and 1½-in. (38.1-mm) hose, a 2½-in. by 1½-in. (63.5-mm by 38.1-mm) gated wye and 1½-in. (38.1-mm) combination nozzles.

It is recommended that hydrants 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.

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.

**6-3.6** 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 may 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 can occur, requiring many hose streams for control depending on the size of the pile.

Likewise, the frequency of pile turnover and operating methods affect the potential for serious internal fires. Piles built using methods which allow a concentration of fines and piles stored for long periods of time with no turnover are subject to internal heating which, 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 above gallonage plus allowance for operational uses and special extinguishing equipment at a residual pressure of 60 to 100 psi (413.7 to 689.5 kPa) at the hydrants.

**6-3.7** Standard automatic sprinkler protection should be provided in all tunnels and enclosures under the pile.

(See NFPA 13, *Standard for the Installation of Sprinkler Systems*.) All other handling and conveyor installations of combustible construction or elevated ones of noncombustible construction which are hood-enclosed should 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*.)

**6-3.8** Power-operated, shovel- or scoop-type vehicles, dozers, or similar equipment should be available for use in moving stored material for fire fighting. With this equipment availability, 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.

**6-3.9** Temporary conveyors and motors on the surface or adjacent to the piles should be avoided.

**6-3.10** Physical protection should 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 be maintained around all potential heat sources.

**6-3.11** Care should be exercised to prevent tramp metal from entering the piles or sections of blower pipes from being buried in the piles. Tramp metal collectors and/or detectors are recommended on all conveyor and/or blower systems.

#### **6-4 Exposure Protection.**

**6-4.1** 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 not be permitted in any area where sparks could reach the storage piles.

**6-4.2** Buildings or other structures near storage piles may pose a serious exposure hazard to the pile. A clear space should 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 is recommended. Greater clearance is desirable when piles are high and side slopes are greater than 60 degrees.

## Chapter 7 Outside Storage of Logs

### 7-1 Application.

**7-1.1** The intent of these recommendations is to provide fire protection guidance 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 recommendations do not apply to stacked piles of cordwood; however, where such material is stored in ranked piles, these recommended safe practices may 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 recommended herein which are intended to be applied with due consideration of all local factors involved.

**7-1.2** In addition to the recommendations contained in this chapter, the provisions outlined in Chapter 8, "General Fire Protection," should apply to all outside storage of logs except as modified herein.

### 7-2 General.

**7-2.1** 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 management and should include:

- (a) Selection, design and arrangement of storage yard areas and materials handling equipment based upon sound fire prevention and protection principles.
- (b) Facilities for early fire detection, transmission of alarm and fire extinguishment.
- (c) Fire lanes to separate large piles and provide access for effective fire fighting operations.
- (d) Separation of yard storage from mill operations and other exposing properties.
- (e) An effective fire prevention maintenance program, including regular yard inspections by trained personnel.

**7-2.2** Special problems of construction and protection are involved when logs are stored on piers or wharves. NFPA 87, *Standard for the Construction and Protection of Piers and Wharves*, and the authority having jurisdiction should be consulted in each case.

### 7-3 Basic Log Yard Protection.

**7-3.1** 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.

**7-3.2** All-weather roadways capable of supporting fire department apparatus should be provided to the plant and yard from public highways.

**7-3.3** All sides of each cold deck should be accessible by means of fire lanes. A fire lane width of  $1\frac{1}{2}$  times pile height, but not less than 20 ft (6.1 m), is recommended 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). 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 7-3.3.)

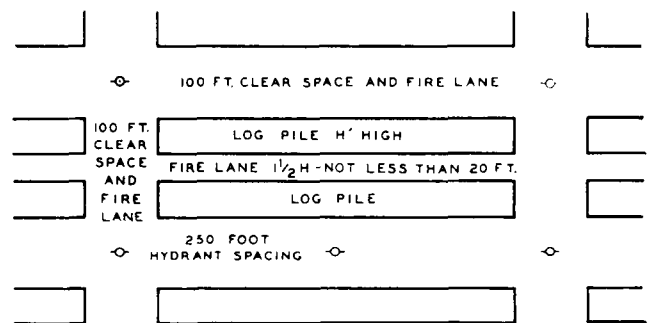


Figure 7-3.3 Layout of Log Storage Yard.  
SI Units: 1 ft = 0.30 m

**7-3.4** For basic fire protection, the hydrant system should be capable of supplying at least four  $2\frac{1}{2}$ -in. (63.5-mm) hose streams simultaneously [1000 gpm (63.1 L/sec) minimum] while maintaining a positive residual pressure in the fire protection hydrant system.

NOTE: The usual practice of maintaining a minimum residual pressure of 20 psi (137.9 kPa) is recommended.

Where large-scale fire fighting operations may be expected, larger water supplies with adequate mains are needed. (See Section 7-4.)

For early extinguishment with basic fire protection, hydrants should be so spaced with sufficient  $2\frac{1}{2}$ -in. (63.5-mm) hose attached to permit rapid hose laying to all parts of the piling areas. For this reason, it is recommended that hydrants 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 should preferably 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*.)

**7-3.5** Dynamite should never be used as a means to reclaim frozen log piles.

**7-3.6** During dry weather, piles should be wet down periodically. The installation of a portable piping system on the top of each log pile equipped with irrigation or lawn-type sprinklers is recommended.

#### 7-4 Special Log Yard Protection.

**7-4.1** Small log yards containing a single cold deck of low height [10 ft (3.0 m) or less], having good access and well separated from other property, present minimum hazards that generally require only the basic protection provisions of Section 7-3 for fire control. Higher piles, multiple piles over extensive areas, congested storage or serious exposure situations present increased hazards which require additional safeguards and protection facilities. In yards requiring more than the basic protection provisions of Section 7-3 for fire control, the following provisions are recommended as a guide. The relative importance of these provisions and the degree to which they may be needed will vary with yard conditions and the authority having jurisdiction should be consulted in all cases.

**7-4.2** Adequate water supplies and large mains should be provided to supply large stream equipment such as portable turrets and deluge sets which require 750 to 1000 gpm (47.3 to 63.1 L/sec) for each appliance. Monitor towers may require supplies in excess of 1000 gpm (63.1 L/sec) for each unit. In large yards where the hazard is severe many of these devices may be operated simultaneously.

**7-4.3** Fire lanes suitable for fire department operation should be provided as outlined in 7-3.3. 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.

**7-4.4** Pile heights should be limited. Heights in excess of 20 ft (6.1 m) seriously restrict effective extinguishing operations as 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 and/or mobile elevated nozzles be provided, and mobile elevated nozzles should be considered when piling height exceeds 12 ft (3.7 m).

### Chapter 8 General Fire Protection

#### 8-1 Application.

**8-1.1** 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 Section 8-2 reduces fire occurrences. Principles of good fire protection are set forth in Sections 8-3 and 8-4.

**8-1.2** These principles are intended to apply to all facilities as outlined in Chapters 3 through 7.

#### 8-2 Operational Fire Prevention.

**8-2.1** Weeds, grass and similar vegetation should be prevented throughout the entire yard and should be sprayed as 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.

**8-2.2** 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 quantity or location which will constitute an undue fire hazard.

**8-2.3** Smoking should be prohibited except in specified safe locations. "No Smoking" signs should be posted in the yard except in specific locations designated as safe for smoking and signs permitting smoking should be posted in those areas. Smoking areas should be provided with approved noncombustible ash receptacles. Smoking should be specifically prohibited in and around railroad cars.

**8-2.4** 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 permit entry of fire department apparatus.

**8-2.5** 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.

**8-2.6** Vehicles and other power devices should be of an approved type, safely maintained and operated. Vehicle fueling operations should be conducted in specified safe locations, isolated from storage areas and principal operating buildings. (*See NFPA 505, Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance and Operation.*)

**8-2.6.1** Diesel or gasoline fueled vehicles which 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.

**8-2.7** All electrical equipment and installations should conform to the provisions of NFPA 70, *National Electrical Code*®.

**8-2.8** 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.

**8-2.9** Suitable safeguards should be provided to minimize the hazard of sparks from 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, 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.

**8-2.10** 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.

**8-2.11** 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.

**8-2.12** If yard storage areas are located in regions highly susceptible to lightning strikes, consideration should be given to the installation of lightning protection on masts or towers to provide area protection. (See NFPA 78, *Lightning Protection Code*.)

**8-2.13** No cutting, welding or other use of open flames or spark-producing equipment should be permitted in the storage area unless by an approved permit system.

### **8-3 Exposure Protection.**

#### **8-3.1 Exposure to the Yard.**

**8-3.1.1** Yard areas should be separated from plant operations and other structures so that fire exposure into the yard will be minimized. Minimum separation should be by means of clear space permanently available for fire fighting operations, and the clear space width should 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.

**8-3.1.2** 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 sawmills, planing mills, treating plants, adzing mills, and similar buildings without essentially blank walls should be separated from yard storage by a clear space as recommended by NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*.

**8-3.1.3** 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 yard. (See 8-3.2.)

**8-3.1.4** Forest, brush, and grass fire exposure should be minimized by providing adequate clear space which is carefully kept free of combustible vegetation. Clear space widths at least equivalent to fire lanes should be provided for grass exposures, and clear space widths of at least 100 ft (30.5 m) should be provided for light brush exposures. In forested areas a wider clear space should be provided.

#### **8-3.2 Exposure from the Yard.**

**8-3.2.1** Fire exposure to adjacent structures and nearby property constitutes one of the major fire protection problems of forest products storage operations which can be solved satisfactorily only by cooperation between adjacent property owners. The authority having jurisdiction should be consulted in all cases.

**8-3.2.2** The special protection facilities, as provided elsewhere in this recommended practice, 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 contemplates 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 be provided as may be practical through one or more of the following:

(a) By providing greater clear space.

(b) By use of 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.

(c) By employing perimeter stacking methods that will furnish the equivalent of barrier walls, i.e., materials of greatest thickness and green flat-stacked stock.

(d) By use of wall construction for exposed structures having adequate fire resistance.

(e) By use of automatic sprinkler systems specially designed for protection of the exposed structures.

### **8-4 Fire Detection and Extinguishment.**

**8-4.1** In all forest product storage operations, provision should be made for early fire detection and extinguishment. This requires 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.

**8-4.2** 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.