

NFPA 230

Standard for the Fire Protection of Storage

2003 Edition



NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 230
Standard for the
Fire Protection of Storage

2003 Edition

This edition of NFPA 230, *Standard for the Fire Protection of Storage*, was prepared by the Technical Committee on General Storage and acted on by NFPA at its November Association Technical Meeting held November 16–20, 2002, in Atlanta, GA. It was issued by the Standards Council on January 17, 2003, with an effective date of February 6, 2003, and supersedes all previous editions.

This edition of NFPA 230 was approved as an American National Standard on January 17, 2003.

Origin and Development of NFPA 230

The creation of NFPA 230 is the result of a Standards Council directive to consolidate information pertaining to sprinkler systems. The portions of NFPA 231, 231C, 231D, 231E, and 231F containing sprinkler system information were moved into NFPA 13, *Standard for the Installation of Sprinkler Systems*. As part of this effort, nonsprinkler system-related information pertaining to storage operations that was previously located in NFPA 231, 231C, 231D, 231E, and 231F and all of NFPA 46 was redesignated as NFPA 230 and consolidated to minimize duplication of fire protection requirements.

NFPA 230 was revised for the 2003 edition to comply with the latest edition of the NFPA *Manual of Style*. The previous Appendix E material on the outdoor storage of forest products was incorporated into the standard, and a separate chapter on outdoor storage of idle pallets was formed from consolidation of previous NFPA 230 provisions.

The 2003 edition is dedicated to Salvatore Gitto and his family. Mr. Gitto was a victim of the tragedies of September 11, 2001, and a decade-long volunteer as a member of NFPA Technical Committees responsible for fire protection documents addressing storage.

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

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.

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NFPA 230

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, Annex G lists the complete title and edition of the source documents for both mandatory and nonmandatory extracts. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex G.

Chapter 4 is extracted from NFPA 13, *Standard for the Installation of Sprinkler Systems*.

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 included in the scope of this standard shall include palletized storage, solid-piled storage, and storage in bin boxes, on shelves, or on racks.

1.1.3 Outside storage configurations of forest products included in the scope of this standard shall include stacked storage, piles, and cold decks.

1.1.4 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 11.6
- (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 covered by other NFPA standards, except where specifically mentioned herein
- (6) Storage on plastic shelves on racks
- (7)*Miscellaneous tire storage
- (8) Forest products stored on piers, wharves, and raised platforms, as addressed in NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*

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 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.

1.3.1 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.

1.3.2 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.

1.3.3 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.

1.4 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.

1.5* Units.

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

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

1.5.3* Either all metric values or all English values shall be used in the application of this standard.

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, *Uniform Fire Code*™, 2003 edition.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2002 edition.

NFPA 11A, *Standard for Medium- and High-Expansion Foam Systems*, 2002 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2002 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 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 1999 edition.

NFPA 70, *National Electrical Code*®, 2002 edition.

NFPA 72®, *National Fire Alarm Code*®, 2002 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*®, 2003 edition.

NFPA 220, *Standard on Types of Building Construction*, 1999 edition.

NFPA 221, *Standard for Fire Walls and Fire Barrier Walls*, 2000 edition.

NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, 2000 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation*, 2002 edition.

NFPA 601, *Standard for Security Services in Fire Loss Prevention*, 2000 edition.

2.3 Other Publication.

2.3.1 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 (AHJ). The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

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 or annex, 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]

3.3.4* 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).

3.3.4.1 Fire-Packed Baled Cotton. 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 Cotton Bale. An unwrapped cotton bale secured with wire or steel straps.

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

3.3.6 Bulkhead. A vertical barrier across a rack.

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

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

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

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

3.3.11 Clearance. The distance from the top of storage to the ceiling sprinkler deflectors. [13:3.9]

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

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

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

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

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

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

3.3.18* Conventional Pallets. A material-handling aid designed to support a unit load with openings to provide access for material-handling devices. (See Figure A.3.3.18.)

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

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

3.3.21 Driveway. A clear space suitable for fire-fighting operations by motorized fire apparatus.

3.3.22* 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.

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

3.3.24 Flameover. A fire that spreads rapidly over the exposed linty surface of cotton bales.

3.3.25 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.

3.3.26 Height.

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

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

3.3.27 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.

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

3.3.29 Log. Felled tree from which all the branches have been removed.

3.3.30 Lumber. Wood from felled trees having a section produced by lengthwise sawing or chipping of logs or other solid wood of large dimensions and possible crosscutting and/or further machining to obtain a certain size and includes boards, dimension lumber, timber and similar wood products.

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

3.3.32 Packaging. A commodity wrapping, cushioning, or container. [13:3.9]

3.3.33 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.

3.3.34* Rack. Any combination of vertical, horizontal, and diagonal members that supports stored materials.

3.3.34.1 Double-Row Racks. Two single-row racks placed back-to-back having a combined width up to 3.7 m (12 ft), with aisles of at least 1.1 m (3.5 ft) on each side. [13:3.10]

3.3.34.2* Movable Racks. Racks on fixed rails or guides. [13:3.10]

3.3.34.3 Multiple-Row Racks. Racks greater than 3.7 m (12 ft) wide or single- or double-row racks, separated by aisles less than 1.1 m (3.5 ft) wide having an overall width greater than 3.7 m (12 ft). [13:3.10]

3.3.34.4* Portable Racks. Racks that are not fixed in place. [13:3.10]

3.3.34.5 Single-Row Racks. Racks that have no longitudinal flue space and that have a width up to 1.8 m (6 ft), with aisles at least 1.1 m (3.5 ft) from other storage. [13:3.10]

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

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

3.3.37 Solid Shelving. Solid, slatted, and other types of shelving located within racks that obstruct sprinkler water penetration down through the racks. [13:3.10]

3.3.38 Storage.

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

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

3.3.38.3 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.

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

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

3.3.38.6 Laced Storage. Storage of tires so that the sides of the tires overlap, creating a woven or laced appearance. [See Figure A.8.1(g).]

3.3.38.7 Miscellaneous Storage. Storage that does not exceed 3.66 m (12 ft) in height and is incidental to another occupancy use group. Such storage shall not constitute more than 10 percent of the building area or 372 m² (4000 ft²) of the sprinklered area, whichever is greater. Such storage shall not exceed 93 m² (1000 ft²) in one pile or area, and each such pile or area shall be separated from other storage areas by at least 7.62 m (25 ft). [13:3.3]

3.3.38.8 Miscellaneous Tire Storage. The storage of rubber tires that is incidental to the main use of the building. Storage areas shall not exceed 186 m² (2000 ft²). On-tread storage piles, regardless of storage method, shall not exceed 7.6 m (25 ft) in the direction of the wheel holes. Acceptable storage arrangements include (1) on-floor, on-side storage up to 3.7 m (12 ft) high; (2) on-floor, on-tread storage up

to 1.5 m (5 ft) high; (3) double-row or multirow fixed or portable rack storage on-side, or on-tread, up to 1.5 m (5 ft) high; (4) single-row fixed or portable rack storage on-side, or on-tread, up to 3.7 m (12 ft) high; and (5) laced tires in racks up to 1.5 m (5 ft) high. [13:3.11]

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

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

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

3.3.38.12 Paper Storage.

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

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

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

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

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

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

3.3.38.16 Yard Storage. Storage of commodities in outdoor areas.

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

3.3.40 Tactics. The method of securing the objectives laid out in the strategy through the use of personnel and equipment to achieve optimum results.

3.3.41 Tire.

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

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

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

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

3.3.43 Wood Panel. Board or sheet made from veneers, particles or fibers of wood and includes plywood, oriented strand-board and similar wood products.

3.3.44 Yard.

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

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

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

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

Chapter 4 General

4.1 Classification of Commodities.

4.1.1 Commodity classification and the corresponding protection requirements shall be determined based on the makeup of individual storage units (i.e., unit load, pallet load).

4.1.2 When specific test data of commodity classification by a nationally recognized testing agency are available, the data shall be permitted to be used in determining classification of commodities.

4.1.3 Mixed Commodities.

4.1.3.1 Protection requirements shall not be based on the overall commodity mix in a fire area.

4.1.3.2 Unless the requirements of 4.1.3.3 or 4.1.3.4 are met, mixed commodity storage shall be protected by the requirements for the highest classified commodity and storage arrangement.

4.1.3.3 The protection requirements for the lower commodity class shall be permitted to be utilized where all of the following are met:

- (1) Up to 10 pallet loads of a higher hazard commodity, as described in 4.1.5 and 4.1.6, shall be permitted to be present in an area not exceeding 3716 m² (40,000 ft²).
- (2) The higher hazard commodity shall be randomly dispersed with no adjacent loads in any direction (including diagonally).
- (3) Where the ceiling protection is based on Class I or Class II commodities, the allowable number of pallet loads for Class IV or Group A plastics shall be reduced to five.

4.1.3.4 Mixed Commodity Segregation. The protection requirements for the lower commodity class shall be permitted to be utilized in the area of lower commodity class, where the higher hazard material is confined to a designated area and the area is protected to the higher hazard in accordance with the requirements of this standard.

4.1.4 Pallet Types.

4.1.4.1 When loads are palletized, the use of wooden or metal pallets shall be assumed in the classification of commodities.

4.1.4.2 For Class I through Class IV, when unreinforced polypropylene or high-density polyethylene plastic pallets are used, the classification of the commodity unit shall be increased one class (e.g., Class III will become Class IV and Class IV will become cartoned unexpanded Group A plastics).

4.1.4.3 For Class I through Class IV, when reinforced polypropylene or high-density polyethylene plastic pallets are used, the classification of the commodity unit shall be increased two classes (e.g., Class II will become Class IV and Class III will become cartoned unexpanded Group A plastic commodity). Reinforced polypropylene or reinforced high-density polyethylene plastic pallets shall be marked with a molded symbol to indicate that the pallet is reinforced.

4.1.4.4 For Class I through Class IV when other than polypropylene or high-density polyethylene plastic pallets are used, the classification of the commodity unit shall be determined by specific testing conducted by a national testing laboratory or shall be increased two classes.

4.1.4.5 No increase in the commodity classification shall be required for Group A plastic commodities stored on plastic pallets.

4.1.4.6 For ceiling-only sprinkler protection, the requirements of 4.1.4.2 and 4.1.4.3 shall not apply where plastic pallets are used and where the sprinkler system uses spray sprinklers with a K-factor of 16.8.

4.1.4.7 The requirements of 4.1.4.2 through 4.1.4.4 shall not apply to nonwood pallets that have demonstrated a fire hazard that is equal to or less than wood pallets and are listed as such.

4.1.5 Commodity Classes.

4.1.5.1 Class I. A Class I commodity shall be defined as a noncombustible product that meets one of the following criteria:

- (1) Placed directly on wooden pallets
- (2) Placed in single-layer corrugated cartons, with or without single-thickness cardboard dividers, with or without pallets
- (3) Shrink-wrapped or paper-wrapped as a unit load with or without pallets

4.1.5.2 Class II. A Class II commodity shall be defined as a noncombustible product that is in slatted wooden crates, solid wood boxes, multiple-layered corrugated cartons, or equivalent combustible packaging material, with or without pallets.

4.1.5.3 Class III.

4.1.5.3.1 A Class III commodity shall be defined as a product fashioned from wood, paper, natural fibers, or Group C plastics with or without cartons, boxes, or crates and with or without pallets.

4.1.5.3.2 A Class III commodity shall be permitted to contain a limited amount (5 percent by weight or volume or less) of Group A or Group B plastics.

4.1.5.4 Class IV.

4.1.5.4.1 A Class IV commodity shall be defined as a product, with or without pallets, that meets one of the following criteria:

- (1) Constructed partially or totally of Group B plastics
- (2) Consists of free-flowing Group A plastic materials
- (3) Contains within itself or its packaging an appreciable amount (5 percent to 15 percent by weight or 5 percent to 25 percent by volume) of Group A plastics

4.1.5.4.2 The remaining materials shall be permitted to be metal, wood, paper, natural or synthetic fibers, or Group B or Group C plastics.

4.1.6 Classification of Plastics, Elastomers, and Rubber. Plastics, elastomers, and rubber shall be classified as Group A, Group B, or Group C plastics.

4.1.6.1 Group A. The following materials shall be classified as Group A:

- (1) ABS (acrylonitrile-butadiene-styrene copolymer)
- (2) Acetal (polyformaldehyde)
- (3) Acrylic (polymethyl methacrylate)
- (4) Butyl rubber
- (5) EPDM (ethylene-propylene rubber)
- (6) RP (fiberglass-reinforced polyester)
- (7) Natural rubber (if expanded)
- (8) Nitrile-rubber (acrylonitrile-butadiene-rubber)
- (9) PET (thermoplastic polyester)
- (10) Polybutadiene
- (11) Polycarbonate
- (12) Polyester elastomer
- (13) Polyethylene
- (14) Polypropylene
- (15) Polystyrene
- (16) Polyurethane
- (17) PVC (polyvinyl chloride — highly plasticized, with plasticizer content greater than 20 percent) (rarely found)
- (18) SAN (styrene acrylonitrile)
- (19) SBR (styrene-butadiene rubber)

4.1.6.2 Group B. The following materials shall be classified as Group B:

- (1) Cellulosics (cellulose acetate, cellulose acetate butyrate, ethyl cellulose)
- (2) Chloroprene rubber
- (3) Fluoroplastics (ECTFE — ethylene-chlorotrifluoro-ethylene copolymer; ETFE — ethylene-tetrafluoroethylene copolymer; FEP — fluorinated ethylene-propylene copolymer)
- (4) Natural rubber (not expanded)
- (5) Nylon (nylon 6, nylon 6/6)
- (6) Silicone rubber

4.1.6.3 Group C. The following materials shall be classified as Group C:

- (1) Fluoroplastics (PCTFE — polychlorotrifluoroethylene; PTFE — polytetrafluoroethylene)
- (2) Melamine (melamine formaldehyde)
- (3) Phenolic
- (4) PVC (polyvinyl chloride — flexible — PVCs with plasticizer content up to 20 percent)
- (5) PVDC (polyvinylidene chloride)
- (6) PVDF (polyvinylidene fluoride)
- (7) PVF (polyvinyl fluoride)
- (8) Urea (urea formaldehyde)

4.1.7* Classification of Rolled Paper Storage. For the purposes of this standard, the classifications of paper described in 4.1.7.1 through 4.1.7.4 shall apply and shall be used to determine the fire protection design criteria.

4.1.7.1 Heavyweight Class. Heavyweight class shall be defined so as to include paperboard and paper stock having a basis weight [weight per 92.9 m² (1000 ft²)] of 9.1 kg (20 lb).

4.1.7.2 Mediumweight Class. Mediumweight class shall be defined so as to include all the broad range of papers having a basis weight [weight per 92.9 m² (1000 ft²)] of 4.5 kg to 9.1 kg (10 lb to 20 lb).

4.1.7.3 Lightweight Class. Lightweight class shall be defined so as to include all papers having a basis weight [weight per 92.9 m² (1000 ft²)] of 4.5 kg (10 lb).

4.1.7.4 Tissue.

4.1.7.4.1 Tissue shall be defined so as to include the broad range of papers of characteristic gauzy texture, which, in some cases, are fairly transparent.

4.1.7.4.2 For the purposes of this standard, tissue shall be defined as the soft, absorbent type, regardless of basis weight — specifically, crepe wadding and the sanitary class including facial tissue, paper napkins, bathroom tissue, and towelings.

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.** (See Annex C.)

5.1.3.1 Protection outlined in this standard shall apply to buildings with or without smoke and heat vents.

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

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 not less than 182°C (360°F).

5.2 Storage Arrangement.

5.2.1* Piling Procedures and Precautions.

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.

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, not less than 30.5 cm (1 ft) 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 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 0.9 m (3 ft) 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 Clearance shall be maintained around the path of fire door travel to ensure proper operation and inspection.

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 not less than 61 cm (24 in.) 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. (See A.6.1.)

5.2.4 Flammable and Combustible Liquids.

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

5.2.4.2 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 idle pallets shall have a fill time of not more than 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 not more than one-half the listed spacing in accordance with NFPA 72®, *National Fire Alarm Code*®.

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 38-mm (1½-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 75 m (250 ft), 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 E* and *Annex F*), facility emergency personnel shall be trained to have knowledge of the following:

- (1) The pile and building 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
- (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 security features of the premises
- (8) The operation of foam systems, evacuation procedures, and 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.

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

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*.

5.4 Building Equipment, Maintenance, and Operations.

5.4.1 Mechanical-Handling Equipment — Industrial Trucks.

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. (See *Annex C*.)

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.

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 7.6 m (25 ft) of the working area and flame-proof 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 maintained in functional condition at all times.

5.4.6.2* All water-based fire protection 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 it is installed, metal halide lighting shall be selected, installed, and maintained such that catastrophic failure of the bulb shall not ignite materials below.

Chapter 6 Protection of Palletized, Solid Pile, Bin Box, and On-Shelf Storage

6.1* Application. 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.

Chapter 7 Protection of Rack Storage

7.1 Application. 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. (*See Annex C.*)

7.2 Building Construction.

7.2.1 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*.

7.2.2 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 NFPA 13, *Standard for the Installation of Sprinkler Systems*.

7.2.3 For sprinklered buildings with rack storage of over 4.6 m (15 ft) 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 fire resistance rating not less than 1 hour, unless the installation meets the requirements of 12.3.1.7 in NFPA 13, *Standard for the Installation of Sprinkler Systems*.

7.3 Storage Arrangement.

7.3.1* Rack Structure. Rack configurations shall be approved.

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

7.3.3* Aisle Widths.

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

7.3.3.2 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*).

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

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

7.3.4 Fire Protection — General.

7.3.4.1 High-Expansion Foam.

7.3.4.1.1* 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.

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

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

- (1) At one-half listed linear spacing [e.g., 4.6 m × 4.6 m (15 ft × 15 ft) rather than 9.1 m × 9.1 m (30 ft × 30 ft)] when the following conditions exist:
 - (a) Detectors are installed at the ceiling only.
 - (b) The clearance from the top of storage does not exceed 3.1 m (10 ft).
 - (c) The height of storage does not exceed 7.6 m (25 ft).
- (2) At the ceiling at listed spacing and on racks at alternate levels
- (3) Where listed for rack storage installation and installed 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

7.3.5 High-Expansion Foam Submergence.

7.3.5.1 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 7.6 m (25 ft) in height:

- (1)*When high-expansion foam systems are used without sprinklers, the submergence time shall be not more than 5 minutes for Class I, Class II, or Class III commodities.
- (2) When high-expansion foam systems are used without sprinklers, the submergence time shall be not more than 4 minutes for Class IV commodities.
- (3) When high-expansion foam systems are used in combination with ceiling sprinklers, the submergence time shall be not more than 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 submergence time shall be not more than 5 minutes for Class IV commodities.

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

- (1) Ceiling sprinklers shall be used in combination with the high-expansion foam system.
- (2) The submergence time for the high-expansion foam shall be not more than 5 minutes for Class I, Class II, or Class III commodities.
- (3) The submergence time for the high-expansion foam shall be not more than 4 minutes for Class IV commodities.

Chapter 8 Protection of Rubber Tires

8.1* Application. 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. Chapter 8 shall not apply to scrap tires storage (*see Annex F*).

8.2 Building Arrangement.

8.2.1 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 4.6 m to 6 m (15 ft to 20 ft) in height, columns shall have 1-hour fireproofing.
- (2) For storage exceeding 6 m (20 ft) in height, columns shall have 2-hour fireproofing for the entire length of the column, including connections with other structural members.

8.2.2 Fire Walls.

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

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

8.2.3* Travel Distance to Exits. Travel distance to exits shall be in accordance with NFPA 101®, *Life Safety Code*®.

8.3 Storage Arrangement.

8.3.1 Piling Procedures.

8.3.1.1* Piles that are not adjacent to or located along a wall shall be not more than 15 m (50 ft) in width.

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

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

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

8.3.2 Clearances.

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

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

8.3.2.3 Where protection in accordance with this standard is provided, stored tires shall be segregated from other combustible storage by aisles not less than 2.4 m (8 ft) wide.

8.4 Fire Protection.

8.4.1 Fire Emergency Organization. See Annex E.

Chapter 9 Protection of Roll Paper

9.1 Application. 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 that stored on a single floor pallet or raised floor platform

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 Reserved

Chapter 11 Protection of 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 outside used for the storage of forest products.

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

- (1) Outside storage of lumber and wood panel products at retail and wholesale lumber storage yards
- (2) Outside storage of lumber and wood panel products at other than retail and wholesale storage 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 and hogged material
- (5) Outside storage of logs

11.2 General Fire Protection.

11.2.1 Application. The provisions contained in Section 11.2 shall apply to all facilities in Section 11.3 through Section 11.7.

11.2.2* Operational Fire Prevention.

11.2.2.1* 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.

11.2.2.2 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.

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

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

11.2.2.3 Access into yard areas by unauthorized persons shall be prohibited.

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

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

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

11.2.2.7 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 principal 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.

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

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

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

11.2.2.11 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.

11.2.2.12 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.

11.2.2.13 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.

11.2.3 Exposure Protection. Exposure to the yard shall be protected in accordance with the requirements of 11.2.3.1 through 11.2.3.2.

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

(A) Minimum separation shall be by means of a clear space permanently available for fire-fighting operations.

(B) 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.

11.2.3.2 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 driveway shall be provided for grass exposures, and clear space of a width not less than 30 m (100 ft) shall be provided for light brush exposures.

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

11.2.4* Fire Detection and Extinguishment. A reliable means for prompt transmission of fire alarms to public fire departments and plant emergency organizations shall be provided.

11.3 Outside Storage of Lumber and Wood Panels — Retail and Wholesale Storage 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 requirements 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

11.3.1.2 In addition to the provisions contained in Section 11.3, the provisions outlined in Section 11.2 shall apply to all retail and wholesale storage yards.

11.3.1.3* The provisions outlined in Section 11.4 shall be used for large outside wholesale and distribution 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 upon proven fire prevention and protection principles
- (2) Means for early fire detection, transmission of alarm, and fire extinguishment
- (3) Driveways 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

11.3.2.2* Water supplies shall be provided in accordance with NFPA 1, *Uniform Fire Code*™.

11.3.3 Open Yard Storage.

11.3.3.1* Lumber stacks shall be on stable ground, and paved or surfaced with materials such as cinders, fine gravel, or stone.

11.3.3.2 The method of stacking shall be stable and in an orderly and regular manner.

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

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

11.3.3.5 Driveways shall be spaced so that a grid system of not more than 15.2 m × 45.7 m (50 ft × 150 ft) is produced.

11.3.3.6 Driveways shall comply with the following:

- (1) They shall have a width of not less than 4.6 m (15 ft) and an all-weather surface capable of supporting fire department apparatus.
- (2) The radius of turns shall be designed to accommodate fire department apparatus.

11.3.3.7 Stacking limits shall be designated to indicate yard area and alleyway limits in accordance with 11.3.3.7.1 or 11.3.3.7.2.

11.3.3.7.1 The stacking limits shall be designated with boundary posts having signs that indicate stacking limits unless otherwise permitted by 11.3.3.7.2.

11.3.3.7.2 Where yards have paved areas, painted boundary limits shall be permitted to be used to designate stacking limits.

11.3.4 Exposure Protection.

11.3.4.1 Exposure to the Yard.

11.3.4.1.1 Open yard stacking shall be located with not less than 4.6 m (15 ft) clear space to buildings.

11.3.4.1.2 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.

11.3.4.2* Exposure from the Yard.

11.3.4.2.1 Open yard stacking shall be located with not less than 4.6 m (15 ft) clear space to adjacent property lines.

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

11.4 Outside Storage of Lumber and Wood Panels — Wood Processing Facilities.

11.4.1 Application.

11.4.1.1* The intent of the provisions of Section 11.4 shall be to provide minimum fire protection requirements to minimize the fire hazard in large yard storage areas containing lumber, wood panels, and other similar wood products not intended for retail or wholesale distribution at the site.

11.4.1.2 In addition to the provisions contained in Section 11.4, the provisions outlined in Section 11.2 shall apply to all large yard storage areas for lumber and wood panel products at other than retail or wholesale yards.

11.4.2* General. The fire hazard potential inherent in forest product 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) Means for early fire detection, transmission of alarm, and fire extinguishment
- (3) Driveways to separate large stacks and provide access for effective fire-fighting operations
- (4) Separation of yard storage from mill or other plant operations and other exposing properties
- (5) Effective fire prevention maintenance program, including regular yard inspections by trained personnel

11.4.3* Open Yard Storage.

11.4.3.1* Water supplies shall be provided in accordance with NFPA 1, *Uniform Fire Code*TM.

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

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

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

11.5 Outside Storage of Ties, Poles, and Posts — Pressure-Treating Plants.

11.5.1 Application.

11.5.1.1* The intent of the provisions of Section 11.5 shall be to provide minimum fire protection requirements 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.

11.5.1.2 In addition to the provisions contained in Section 11.5, the provisions outlined in Section 11.2 shall apply to

all outside storage of ties, poles, piles, posts, and other similar forest products at pressure-treating plant yards.

11.5.2* 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 upon sound fire prevention and protection principles
- (2) Means for early fire detection, transmission of alarm, and fire extinguishment
- (3) Driveways 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

11.5.3* Tie Yard Protection.

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

11.5.3.1.1 Alleyways shall not be less than 0.6 m (2 ft) in width.

11.5.3.1.2 Where a minimum alleyway width of 1.2 m (4 ft) is provided, the length of the rows shall be not more than 30 m (100 ft).

11.5.3.1.3 Where an alleyway width less than 1.2 m (4 ft) is provided, the length of the rows shall be not more than 22.5 m (75 ft).

11.5.3.2* Water supplies shall be provided in accordance with NFPA 1, *Uniform Fire Code*TM.

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

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

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

11.6 Outside Storage of Wood Chips and Hogged Material.

11.6.1 Application.

11.6.1.1* The intent of the provisions of Section 11.6 shall be to provide minimum fire protection requirements to minimize the fire hazard in yard storage areas containing wood chips and hogged material.

11.6.1.2 In addition to the provisions contained in Section 11.6, the provisions outlined in Section 11.2 shall apply to all outside storage of wood chips and hogged material, except as modified herein.

11.6.2 General.

11.6.2.1* 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 upon 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) Means for early fire detection and extinguishment
- (4) Driveways 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

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

- (1) The storage site shall be reasonably level, solid ground, or shall be paved with blacktop, concrete, or other hard-surface material.
- (2) Operating plans for the buildup and reclaiming of the pile shall be based on a turnover time of not more than 1 year under ideal conditions.
- (3)*Piles containing other than screened chips made from cleaned and barked logs.
- (4)*The pile size shall be limited.
- (5) Pile heights shall be kept low, particularly piles that inherently carry a larger percentage of fines and are subject to greater compaction.
- (6) 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.
- (7)*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.

11.6.3* Pile Protection.

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

11.6.3.2* Piles shall not exceed 18 m (60 ft) in height, 90 m (300 ft) in width, and 150 m (500 ft) 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.

(B) When piles exceed 150 m (500 ft) in length, they shall be subdivided by driveways having not less than 9 m (30 ft) 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 driveways.

11.6.3.3 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.

11.6.3.4* 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.

11.6.3.5* Water supplies shall be provided in accordance with NFPA 1, *Uniform Fire Code*™.

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

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

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

11.6.3.9 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.

11.6.3.10 Tramp metal collectors or detectors shall be required on all conveyor and blower systems.

11.6.4 Exposure Protection.

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

11.6.4.2* A clear space of not less than 4.6 m (15 ft) shall be maintained between piles and exposing structures, yard equipment, or stock, depending on the degree of exposure hazard.

11.6.4.3* Pile-to-pile clearance of not less than 9 m (30 ft) at the base of the pile shall be provided.

11.7 Outside Storage of Logs.

11.7.1 Application.

11.7.1.1* The provisions of Section 11.7 shall be to provide minimum fire protection requirements to minimize the fire hazard in log yard storage areas containing saw, plywood veneer, or pulpwood logs stored in ranked piles commonly referred to as cold decks.

11.7.1.2 Section 11.7 shall not apply to cordwood.

11.7.1.3 In addition to the provisions contained in Section 11.7, the provisions outlined in Section 11.2 shall apply to all outside storage of logs, except as modified herein.

11.7.2* General. The fire hazard potential inherent in log storage operations with large quantities of combustible materials 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) Means for early fire detection, transmission of alarm, and fire extinguishment
- (3) Driveways 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