231E

NFPA 231E Recommended Practice for the Storage of Baled Cotton 1996 Edition

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An International Standards-Making Organization

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

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

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

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NFPA 231E

Recommended Practice for the

Storage of Baled Cotton

1996 Edition

This edition of NFPA 231E, *Recommended Practice for the Storage of Baled Cotton*, was prepared by the Technical Committee on General Storage and acted on by the National Fire Protection Association, Inc., at its Fall Meeting held November 13-15, 1995, in Chicago, IL. It was issued by the Standards Council on January 12, 1996, with an effective date of February 2, 1996, and supersedes all previous editions.

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.

This edition of NFPA 231E was approved as an American National Standard on February 2, 1996.

Origin and Development of NFPA 231E

In the early 1900s, a group of marine underwriters formulated regulations to reduce the frequency of excessive fire loss in baled cotton facilities. In 1916, following a joint conference with the cotton industry, guidelines were established under the title "Specifications and Standards" (also known as "Marine Standards").

From 1947 through 1969, the sponsorship was through the Cotton Warehouse and Inspection Service (dissolved in 1969). In 1967, interested insurance rating bureaus were added as sponsors, and, in 1969, to prevent conflicts with various rating bureau schedules, the word "Standards" was replaced with "Recommended Good Practices"; however, since 1939, the booklet has been commonly referred to as the "Blue Book."

Numerous revisions have been made over the years to keep current, the last made in 1973. Early in 1978, the committee for the "Blue Book" requested that the NFPA consider a standard on baled cotton storage and handling based on the "Blue Book" recommended practices. The NFPA Correlating Committee for Storage expanded the scope to include all fibers in baled form, which were covered in NFPA 44, *Storage of Combustible Fibers*, which was withdrawn many years ago.

Little data was found on fire experience for baled fibers, other than cotton, and that data was largely empirical in nature.

Therefore, NFPA 231E was developed by consensus of a test group formed in 1978 and made up of the cotton warehousing, cotton processing, and insurance industries, under the auspices of the Technical Committee on General Storage, and is limited to cotton fiber in baled form, with the intent to convert to a standard as field experience becomes available to further substantiate its content.

The 1989 edition was a reconfirmation of the 1984 edition.

The 1996 edition incorporates a number of editorial changes to improve the user friendliness of the document. In addition, the terminology has been updated to reflect current practices.

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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.

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

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Recommended Practice for the

Storage of Baled Cotton

1996 Edition

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

Information on referenced publications can be found in Chapter 7 and Appendix C.

Chapter 1 Introduction

1-1 Scope.

1-1.1 This recommended practice provides fire protection guidance for the storage of baled cotton in buildings and in yards.

1-1.2 None of the provisions outlined should be considered mandatory; however, it is recommended that property owners follow these recommended practices as a minimum means of limiting firespread by the application of the storage methods specified, by the separation of major storages using fire walls or clear spaces, and by the provision of an adequate means of extinguishment.

1-1.3 These guidelines may be permitted to be applied to new or existing facilities.

1-1.4 There is no intent to restrict new technologies or alternative arrangements that offer protection features superior to those outlined.

1-2 General.

1-2.1 Cotton fiber is readily ignitible and burns freely and, when stored in relatively large quantities, poses special fire control problems not generally encountered in other common commodities.

Cotton fiber is compressed to various densities into baled form for transport, storage, and handling and is largely covered by industry-accepted packaging materials and bound by steel, synthetic or wire bands, or wire. The bale surfaces normally are ragged in appearance due to the loose fibrous material not confined by the binding or wrapping. Frequently, this ragged appearance is further aggravated by sampling, which exposes additional fibrous material and can contribute to the rapid spread of fire.

Bale storage in relatively large quantities can pose severe fire control problems due to the potential flashover and the large area of involvement that could overcome even a well designed and supplied sprinkler system; therefore, this recommended practice takes into consideration limits on the number of bales per building or fire division and the size of storage blocks.

Where the bales are tiered or piled in buildings or outdoors, the loose surface fibers are easily ignited in the presence of an ignition source and the fire can spread rapidly over the entire mass or body of the material; this commonly is called "flashover." Fire then can burrow into the bale interiors making detection and extinguishment difficult, particularly in large mass storage. A quick, hot fire then can ensue and spread beyond the control of ordinary extinguishing methods.

In properly arranged storage and with adequate automatic sprinkler protection, fire normally is confined to the pile of origin, although an aisle fire can be expected to involve more than one tier or pile. Sprinklers usually operate beyond the confines of the fire and wet down bales immediately adjacent to the burning pile.

If adequate sprinkler protection is lacking, if tiers or piles are too large or high, if aisle separation is not properly maintained, or if the bales are otherwise improperly arranged, damage to the section, building, or area of involvement will be more severe, if not totally destructive.

1-2.2 Common causes of fire in baled cotton include, but are not limited to:

(a) Fire-packed bales from the ginning or other process.

(b) Steel bands breaking and striking or rubbing (friction) against each other or other metallic objects causing sparks.

(c) Extraneous sparks from sources such as vehicle exhausts and incinerators.

(d) Miscellaneous sources such as cutting and welding, electrical and mechanical faults, and smoking.

1-3 Definitions. Unless expressly stated elsewhere, for the purpose of this document, the following definitions apply:

Approved.* Acceptable to the authority having jurisdiction.

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

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; can also include linters (lint removed from the cottonseed) and motes (residual materials from the ginning process). (*See Table A-1-3.*)

Block Storage. The number of bales closely stacked in cubical form and enclosed by aisles or building sides, or both.

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

Fire-packed. A bale within which a fire has been packed as a result of a process, with ginning being the most frequent cause.

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

Flashover. See Flameover.

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.

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

Naked Bale. A bale secured with wire or steel straps without wrapping.

Racks. Any combination of vertical, horizontal, and diagonal members that supports stored materials. Some rack structures use solid shelves. Racks can be fixed or portable.

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

Tiered Storage. An arrangement in which bales are stored directly on the floor or ground, usually on dunnage where stored outdoors, and two or more bales high.

Yard Storage. An arrangement in which bales are stored outdoors in any open area. See Section 5-2 for additional definitions that apply to yard storage only.

Chapter 2 Building Construction

2-1 Construction.

2-1.1 Buildings used for the storage of baled cotton that is stored and protected in accordance with this recommended practice may be permitted to be of any of the types described in NFPA 220, *Standard on Types of Building Construction*.

2-1.2 Buildings that are equipped, or that are to be equipped, with automatic sprinkler protection also should meet the recommendations of Chapter 4.

2-2 Emergency Smoke and Heat Venting. The protection outlined in this recommended practice applies to buildings with or without roof vents and draft curtains.

2-3 Fire Divisions or Clear Spaces between Buildings.

2-3.1 A fire division is a building, compartment, or section cut off by fire walls or separation.

2-3.1.1 Fire divisions or clear spaces between buildings should be in accordance with NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*.

2-3.1.2 Baled cotton storage generally has a fire load in excess of 15 lb/ft^2 (73 kg/m^2), which would place its classification, according to NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, in the "severe" category.

2-3.2* Fire walls should be of masonry and rated for at least 4 hours (based on NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*; ASTM E 119, *Standard Methods for Fire Tests of Building Construction and Materials*; and UL 263, *Standard for Safety Fire Tests of Fire Resistance of Building Construction and Materials*). Such walls should be parapeted as follows:

(a) For wood frame [Type V (111-000)] and ordinary or heavy timber masonry [Type III (211-200) and Type IV (2 HH)], construction parapets should extend at least 5 ft (1.5 m) above the highest point of any adjacent monitor or roof structure within 50 ft (15.2 m) of the fire wall. Where the monitors or the roof structure adjoins a fire wall, the parapet should extend not less than 7½ ft (2.3 m) horizontally from the vertical side of the roof structure. If intersecting end or side walls are other than masonry, the fire wall should extend outward 10 ft (3.1 m) beyond the end or side wall or should be "teed" at the ends 10 ft (3.1 m) from each side of the wall or should be "elled" 20 ft (6.1 m) and of an equivalent fire rating.

(b) For noncombustible construction [Type II (000)] other than that outlined in 2-3.2(c), parapets should be at least 2½ ft (0.75 m) above the roof. If intersecting side walls are other than masonry, such wall construction should conform to the specifications of 2-3.2(a).

(c) For noncombustible construction [Type II (222-111)] having masonry walls and with roofs of concrete, gypsum, or Class 1 (UL classified) metal deck, the parapet should extend at least 12 in. (0.3 m) above the roof.

(d) For walls and roofs of fire-resistive construction, [Type I (443-332)] parapets are not necessary.

2-3.3 Fire walls should be free of openings. Where openings are necessary, the number should be kept to the minimum necessary, and each side should be protected by an approved and listed 3-hour-rated fire door, installed in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*. Doors should be automatic closing with detectors or fusible links installed on both sides of the opening and interconnected so that the operation of any single detector or fusible link closes both doors simultaneously.

2-3.4 Substantial guards of a size to protect fire doors from damage or obstruction should be provided.

Chapter 3 Storage Arrangements

3-1 General.* This chapter applies to buildings protected by a sprinkler system in accordance with Chapter 4, or to those not so protected. The tier heights, block sizes, and aisle widths outlined may be permitted but represent recommended maximum and minimum limitations. Fire experience and fire tests of high-piled commodities have shown that lower pile heights, smaller block sizes, and wider aisles result in a substantial delay in firespread and in providing for manual fire fighting. Automatic sprinkler effectiveness is also improved substantially, with a reduction in water demand and a decrease in the quantity of goods damaged.

3-2 Storage Blocks.

3-2.1 Storage blocks, tiered or untiered, or on racks, should be limited to 700 bales of compressed cotton or 350 bales of flat cotton. (*See 3-3.4 for a permitted variation and also Table A-1-3 for typical cotton bale types and approximate sizes.*)

3-2.2 The height of tiered or rack storage should be limited to a nominal 15 ft (4.6 m). Rack storage, as used in this document, contemplates baled cotton in a skeleton steel pipe or tubular frame, without shelving, and is limited to a single- or double-row configuration not in excess of two bales deep. Any variation could create a serious handicap to automatic sprinklers that is beyond the design capability and should be referred to the authority having jurisdiction.

3-2.3 Rack storage should not extend over aisles or doorways.

3-2.4 Racks should not be loaded beyond their design capacity and should be designed for seismic conditions in areas where seismic resistance for buildings is required.

3-3 Aisles.

3-3.1 Aisles should be provided and maintained to minimize the spread of fire and to allow convenient access for fire fighting, removal of storage, and salvage operations.

3-3.2 At least one main aisle, 12 ft (3.7 m) or more in width, should be provided in each fire division and arranged to subdivide the storage into two or more approximately equal areas.

3-3.3 Cross aisles separating each storage block should be at least 4 ft (1.2 m) in width. The recommended 4-ft (1.2-m) aisles allow sprinkler water to penetrate the lower areas of storage; however, it should be noted that, for aisles less than 8 ft (2.4 m) in width, a fire can be expected to communicate readily from one block to another, especially in the case of an easily ignitible commodity such as cotton fiber.

3-3.4 Where a 15-ft (4.6-m) cross aisle is provided after every fourth or fifth tiered block, each storage block may be permitted to be increased to 800 bales of compressed cotton and 400 bales of flat cotton. The purpose of this alternate method of tiered storage is to encourage wider cross aisles at least intermittently, without reducing the recommended storage capacity, as an aid in reducing the flashover fire potential. Because of the increase in block sizes, however, it is recommended that the authority having jurisdiction be consulted prior to practicing this method.

3-3.5 Cross aisles separating each single- or double-row rack storage configuration should be at least 10 ft (3.1 m) in width.

3-3.6 Aisles should be maintained free of loose cotton fibers.

3-4 Freshly Ginned Cotton Bales. See Section 5-5.

3-5 Storage of Commodities Other than Cotton.

3-5.1 Cotton warehouses, in general, may be permitted to be used for the storage of other commodities, subject to the following:

(a) The storage of other commodities in a building may be permitted where baled cotton is not stored.

(b) High hazard commodities, such as nitrates or similar oxidizing materials, flammable liquids or gases, explosives, or materials of a highly combustible nature, should not be permitted where baled cotton is stored in the fire division.

(c) Any commodities that could be hazardous in combination with each other should be stored so that they cannot come in contact with each other.

3-5.2 Where it is necessary to store other commodities with baled cotton storage, a clear space of at least 15 ft (4.6 m) should be maintained between the baled cotton storage and other commodities.

3-5.3 Where commodities of different classifications are permitted and stored in the same building, whether on a seasonal or other basis, the protection should be adequate for the most hazardous material. (*For protection of other commodities, see the applicable NFPA storage standards.*)

3-6 Clearances.

3-6.1 Proper clearances from lights or light fixtures should be maintained to prevent possible ignition. Incandescent light fixtures should have guards to prevent ignition of a commodity from hot bulbs where the possibility of contact exists.

3-6.2 No storage should be located within 3 ft (0.9 m) of any electrical switch or panel boards and fuse boxes.

3-6.3 Baled cotton storage and other combustibles should be kept at least 4 ft (1.2 m) from fire door openings so that the transmission of fire through a door opening is minimized.

3-6.4 At least 2 ft (0.6 m) of clearance should be maintained around all doors (other than as indicated in 3-6.3), fire protection equipment (including automatic sprinkler risers, controlling valves, hose stations, and portable extinguishers), and telephones for accessibility.

3-6.5 A clearance of at least 3 ft (0.9 m) should be maintained between the top of storage and the roof or ceiling construction in order to allow sufficient space for the effective use of hose streams in buildings not equipped with automatic sprinkler protection.

Chapter 4 Fire Protection

4-1 Automatic Sprinkler Systems.

4-1.1 Automatic sprinkler protection is not part of the recommendations of this document. However, it is unfortunate that, in a fire situation, human response is, in most cases, unreliable in the first critical moments of fire development. Sprinkler protection is, therefore, the most reliable method of fire detection and suppression. Property owners are encouraged to provide sprinkler protection as the best means of minimizing a large loss. (*See Section 3-5 for sprinkler protection for other than cotton fiber storage.*)

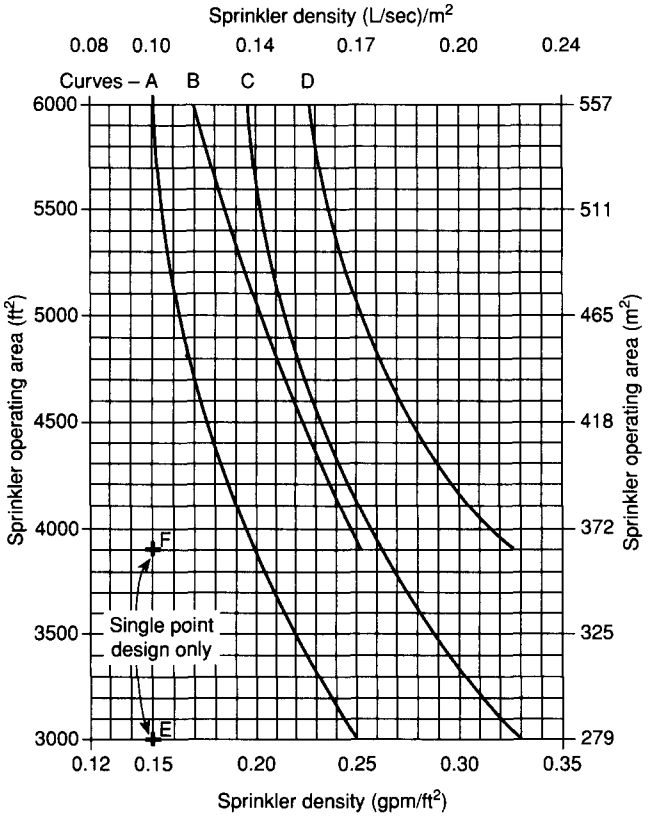
4-1.2 Automatic sprinkler systems, where provided, should be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

Exception: Where modified by this chapter.

4-1.3 For tiered or rack storage up to a nominal 15 ft (4.6 m) in height, sprinkler discharge densities and areas of application should be in accordance with Figure 4-1.3. The density provided for the area of operation can be taken from any point on the selected curve. It is not necessary to meet more than one point on the selected curve.

4-1.3.1 Where roof or ceiling heights would prohibit storage above a nominal 10 ft (3.1 m), the sprinkler discharge density may be permitted to be reduced by 20 percent of that indicated in Figure 4-1.3 but should not be reduced to less than 0.15 gpm/ft^2 [(0.10 L/sec)/m^2].

4-1.3.2 Baled storage that is not tiered can be based on the single-point design curve E for wet-pipe systems and curve F for dry-pipe systems. This untiered design density limits storage to the height of one bale, on side or on end, and would likely prohibit any future tiering without redesign of the sprinkler system.



Curve **Legend**

A – Wet-pipe system for tiered storage to 15 ft (4.6 m)
B – Dry-pipe system for tiered storage to 15 ft (4.6 m)
C – Wet-pipe system for rack storage to 15 ft (4.6 m)
D – Dry-pipe system for rack storage to 15 ft (4.6 m)
E – Wet-pipe system for untiered storage
F – Dry-pipe system for untiered storage

Figure 4-1.3 Sprinkler system design curves.

4-1.3.3 In warehouses that have mixed rack storage, tiered or untiered storage, or a combination of these, the curve applicable to the storage configuration should apply and the highest density recommendation should extend at least 15 ft (4.6 m) beyond the recommended operating area.

4-1.3.4 Minimum sprinkler operating areas should be 3000 ft² (279 m²) for wet-pipe systems and 3900 ft² (363 m²) for dry-pipe systems; the maximum operating area should not exceed 6000 ft² (557 m²). No area credit is recommended for the use of high temperature sprinklers.

4-1.3.5* On new installations, the use of sprinkler heads in the ordinary temperature range is recommended, subject to the maximum ceiling temperatures outlined in NFPA 13, *Standard for the Installation of Sprinkler Systems*.

4-1.4 Clearance between the top of the storage and the sprinkler deflectors should be at least 18 in. (0.45 m). Building heights should allow for proper clearance between the pile height and sprinkler deflectors. Fire tests of high-piled storage have shown that sprinklers are generally more effective if located 1½ ft to 4½ ft (0.45 m to 1.4 m) above the storage height.

4-2 Water Supplies.

4-2.1 The total water supply available should be sufficient to provide the recommended sprinkler discharge density over the area to be protected, plus a minimum of 500 gpm (32 L/sec) for hose streams.

4-2.2 Water supplies should be capable of supplying the total demand for sprinklers and hose streams for not less than 2 hours.

4-2.3 Recommended water supplies contemplate successful sprinkler operation when installed. However, because of the flashover fire potential and inherent unfavorable features of cotton warehousing, there should be an adequate water supply available for fire department use.

4-3 Hydrants. At locations without public hydrants, private hydrants should be provided in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

4-4 Manual Inside Protection.

4-4.1 In buildings of 15,000 ft² (1380 m²) or larger, small hose [1½ in. (38.1 mm)], with combination water spray nozzle, should be provided to reach any portion of a storage area with due consideration to access aisle configuration with a maximum length of 100 ft (30.5 m) of hose. Such small hose should be supplied from one of the following:

(a) Outside hydrants;

(b) A separate piping system for small hose stations in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*;

(c) Valved hose connections on sprinkler risers where such connections are made upstream of the sprinkler control valves;

(d) Adjacent sprinkler systems in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

4-4.2 Portable listed fire extinguishers should be provided in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, and as amended by this chapter. Up to ½ of the required complement of portable fire extinguishers for Class A fires may be permitted to be omitted in storage areas where fixed small hose lines are installed in accordance with 4-4.1.

4-4.2.1 Cotton and its wrappings represent a Class A fire. Experience has shown that extinguishment using "wet water" (a chemical agent additive to lower the surface tension of water, thus increasing its penetrating and spreading qualities) is the most effective on baled cotton fires.

Plain water is effective on surface fires but lacks the penetrating power of wet water.

Dry chemical extinguishers using sodium bicarbonate, potassium bicarbonate, or potassium chloride base powders have been used to control a surface fire on baled fibers and work mainly by coating the fiber with the fire retardant powder, but such chemicals do not affect a smoldering or burrowing fire beneath the surface.

4-4.2.2 Additional listed extinguishers, suitable for Class B and C fires, or multipurpose types, should be provided at each press location and for each motorized vehicle or area of hazard other than Class A.

4-4.3 Wetting Agent Extinguishing Units.

4-4.3.1 Pressurized, wheeled, listed, wetting agent extinguishing units, as specified in NFPA 18, *Standard on Wetting Agents*, may be permitted to be used, subject to the authority having jurisdiction, in lieu of Class A conventional types or small hose lines, provided:

(a) The unit(s) has an equivalent extinguishing effectiveness of 20A for each 15,000 ft^2 (1380 m^2) of floor area or less.

(b) The unit(s) has an equivalent extinguishing effectiveness of 40A or more for each 30,000 ft^2 (2760 m^2) of floor area.

4-4.3.2 Placement of extinguishing units should be at locations readily accessible to the main aisles and properly protected from damage.

4-4.4 Extinguishers should be of the nonfreezing type or protected against freezing where necessary.

4-5 Alarm Service.

4-5.1 Automatic sprinkler systems should have approved central station, local, auxiliary, remote station, or proprietary waterflow supervised alarm service. Local waterflow alarm service may be permitted where standard guard service is provided in accordance with NFPA 601, *Standard for Security Services in Fire Loss Prevention*.

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

4-5.2 Valves should be supervised in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

4-6 Fire Emergency Planning.

4-6.1 Arrangements should be made to allow rapid entry into the premises by the municipal fire department, police department, or other authorized personnel in the case of fire or other emergency.

4-6.2 Industrial fire brigades, where provided, should be in compliance with NFPA 600, *Standard on Industrial Fire Brigades*.

4-6.3 Manual fire-fighting operations should not be considered to be a substitute for sprinkler operation. The sprinkler system should be kept in operation during manual fire-fighting operations until visibility has improved so that the fire can be clearly seen and the extent of fire has been reduced to a mop-up stage. It is essential that charged hose lines be available before venting is started because of a possible increase in fire intensity. When a sprinkler valve is closed, a designated person should remain at the valve so it can be opened promptly if necessary. The water supply for the sprinkler system should be augmented, where possible, and care should be exercised so that the water supply for the sprinkler system is not rendered ineffective by the use of excessive hose streams.

4-6.4* Fire departments should be encouraged to make periodic inspections of the property in cooperation with management and personnel for the purposes of loss prevention and prefire planning.

4-6.5 A fire watch should be maintained when the sprinkler protection is not in service.

Chapter 5 Yard Storage

5-1 General.

5-1.1 This chapter applies to baled cotton storage yards designated for that purpose. Generally, yards are at or convenient to compression warehouses and gins but can include storage at locations remote from routine operations.

5-1.2 This chapter refers to seed cotton trailers or modules, vehicles, incinerators, and other facilities, or exposures from same, only for the purpose of establishing recommended distances to designated yard storage areas.

5-2 Definitions. Unless expressly stated elsewhere, the following definitions are for the purpose of this chapter only:

Block. A basic yard storage unit comprising multiple row storage with clear spaces on all sides.

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

Group of Yards. Multiple yards with a maximum block and minimum clear space limitations.

Protected. See Section 5-7.

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

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

Unprotected. Not meeting the provisions of Section 5-7.

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

5-3 Site. Preference should be given to locations having adequate public fire and police protection, adequately supplied fire hydrants for protection of yard areas, good drainage, all-weather roads or driveways for emergency vehicle use, and remoteness from buildings or other combustible storages or facilities that could constitute an exposure hazard.

5-4 Storage Arrangements.

5-4.1 Tiered storage is not recommended; however, yard or outdoor storage conditions can necessitate storage methods other than those outlined. The authority having jurisdiction should be consulted for approval in such cases.

5-4.2 Storage should be arranged to provide reasonable fire breaks and ready access for fire fighting.

5-4.3 A row of storage should be limited to 100 bales.

5-4.4 Maximum storage limitations should be as follows:

(a) Protected block, 10 rows (1000 bales);

(b) Unprotected block, five rows (500 bales);

(c) Protected yard, five protected blocks (5000 bales);

(d) Unprotected yard, five unprotected blocks (2500 bales);

(e) Protected group yard, four protected yards (20,000 bales);

(f) Unprotected group yard, four unprotected yards (10,000 bales).

5-4.5 Minimum clear spaces should be as follows:

(a) 10 ft (3.1 m) between parallel rows and 25 ft (7.6 m) between rows arranged end-to-end;

(b) 50 ft (15.2 m) between protected or unprotected blocks;

(c) 200 ft (61 m) between protected or unprotected yards;

(d) 1000 ft (305 m) between protected or unprotected group yards.

5-4.6 Rows should be arranged so that prevailing winds blow in the direction of the parallel clear spaces between rows.

5-5 Quarantine Yards.

5-5.1 Freshly ginned cotton bales, commonly called "fire-packed bales," are highly subject to insidious fires originating from the ginning operation. Known or suspect fire-packed bales should be marked as such and kept segregated from other contents or buildings for a period of not less than 5 days; if no fire is detected after that period, the bales then can be handled in a normal manner. (*See Appendix B.*)

5-5.2 A clear space of at least 100 ft (30.5 m) from any yard storage and 25 ft (7.6 m) from all buildings should be established as a quarantine area for known or suspect fire-packed bales.

5-5.3 Known or suspect fire-packed bales should be separated from each other by at least a 10-ft (3.1-m) clear space.

5-6* Unobstructed Clear Space. Unobstructed clear space to designated yard storage should be maintained as follows:

(a) 100 ft (30.5 m) to any approved sprinklered building;

(b) 200 ft (61 m) to any nonapproved sprinklered or nonsprinklered building;

(c) 200 ft (61 m) to an approved incinerator;

(d) 500 ft (152.5 m) to a nonapproved incinerator or open fires;

(e) 100 ft (30.5 m) to vehicle and seed trailer or module parking areas and trash piles;

(f) 50 ft (15.2 m) to roadways and railroad mainlines and sidings;

(g) 200 ft (61 m) upwind of any reconditioning activity;

(h) Yard storage areas should be maintained clear and clean of loose cotton, dry grass, weeds, and combustible trash for a distance of at least 50 ft (15.2 m) around the yard perimeter.

5-7 Fire Protection.

5-7.1 To qualify as a protected yard, hydrants should comply with Section 4-3.

Exception: Where amended by this chapter.

5-7.1.1 All areas of yard storage should be within 500 ft (152.5 m) of a fire hydrant. Adequate clearance should be maintained between storage and hydrants.

5-7.1.2* Hydrant equipment for each yard group (20,000 bales) should consist of:

(a) 250 ft (76.2 m) of 2½-in. (63.5-mm) hose.

(b) 300 ft (91.5 m) of 1½-in. (38.1-mm) hose with provisions to "Y-connect" to the 2½-in. (63.5-mm) hose.

(c) Combination water spray nozzles.

(d) Proper wrenches for hydrant operation and hose connections.

5-7.1.3 Water available to the most remote yard hydrants should be capable of delivering at least 500 gpm (1893 L/min) at an effective pressure for at least a 2-hour period.

5-7.2 Approved extinguishing units should be provided on the basis of an equivalent 40A rating for each protected or unprotected yard area (*see Section 5-4*) or greater fraction thereof.

5-7.2.1 Subject to the authority having jurisdiction, a motorized wet water unit(s) may be permitted to be substituted for that specified in 5-7.2, provided that a unit of 250 gal (946 L) or greater capacity is provided for each group yard area storing up to 20,000 bales.

5-7.2.2 Placement of wheeled or motorized units should be at readily accessible locations within 250 ft (76.2 m) of each yard, protected from damage, and maintained in good operating condition at all times.

5-7.3 Water containers and pails, if used, should be distributed at a ratio of one 40-gal (151-L) or greater container with two pails for each 100 bales of storage. However, wheeled wet water pressure extinguishers may be permitted in lieu of containers and pails.

5-7.4 All motorized vehicles used in designated yard areas should be equipped with a listed multipurpose dry chemical extinguisher of a size appropriate for the anticipated hazard. (*See 4-4.2 for information on portable fire extinguishers.*)

5-7.5 A suitable and reliable means of communication should be available to summon the fire department or other appropriate personnel promptly, to sound a general alarm in the case of fire or other emergency, or both.

5-7.6 Reference should be made to Section 4-6 for fire emergency planning and procedures that apply to yard storage.

5-8 Yard Maintenance and Operations.

5-8.1 Smoking should be strictly prohibited within 100 ft (30.5 m) of yard storage areas, and "no smoking" signs should be posted conspicuously. (*See A-6-6.*)

5-8.2* All internal combustion equipment used in or around yard storage areas should be equipped with a suitable spark arrester-type muffler properly maintained and otherwise approved by the authority having jurisdiction.

5-8.3 Guard Watch Service.

5-8.3.1 Guard watch service should be provided throughout all designated yard storage areas during all shutdown periods when fewer than 5 days have passed after cotton bales have been ginned, or when the total stock exceeds 1000 bales.

5-8.3.2 Hourly rounds should be made and recorded during all nonworking hours using an approved and listed portable clock and having key stations situated to ensure complete coverage of the area of responsibility. Watch service information should be obtained from NFPA 601, *Standard for Security Services in Fire Loss Prevention.*

Chapter 6 Administration, Buildings, Equipment, Maintenance, and Operations

6-1 Administration. The administration of buildings and equipment, and the maintenance thereof, is an important consideration in the reduction of fire incidence and loss. The finest buildings and protective features can be abrogated quickly by neglect of the continuous, necessary maintenance of fire loss prevention programs and protective equipment. Thus, management, at all levels, plays a critical part in the reduction of fire loss.

In addition to the recommendations outlined in this chapter, the liaison between management and personnel should include a meaningful loss prevention program that:

(a) Encourages loss prevention habits;

(b) Teaches the prompt sounding of alarms;

(c) Minimizes panic and effects safe evacuation;

(d) Instructs key personnel in the effective utilization of fire extinguishing equipment and other protective features; and

(e) Teaches basic salvage and cleanup techniques to minimize the downtime of operations.

6-2 Mechanical Handling Equipment.

6-2.1 Industrial Trucks. Power operated industrial trucks and mobile equipment should comply with NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance, and Operation.* Cotton storage and handling areas are defined as Class III, Division 2, hazardous areas and require vehicles designated as types DS, DY, ES, EE, EX, GS, LPS, and GS/LPS.

6-2.1.1 Gasoline and diesel fuel should be prohibited in cotton storage areas, on platforms, and in exposing yard areas. Fueling should be done outside at a well-detached location in accordance with NFPA 30, *Flammable and Combustible Liquids Code.*

Exception: Gasoline and diesel fuel contained in the vehicle tanks may be permitted.

6-2.1.2 Liquefied petroleum gas fuel containers shall be exchanged or removed only outdoors. The valve at the fuel container should be closed and the engine allowed to run until the fuel line is exhausted. Tanks should be refueled only at well-detached locations. LP-Gas fuel systems on LP-Gas dual fuel powered trucks should be in accordance with the applicable provisions of NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

6-2.1.3 Charging equipment for storage batteries should be in a separate area, room, or building designated for that purpose. If located in a separate room, the room should be lined with substantial noncombustible materials constructed to exclude "fly" or lint. Charging areas should be kept free of extraneous combustible materials and trash. Adequate ventilation should be provided to minimize concentrations of hydrogen gas during charging.

6-2.1.4 All mechanical equipment and refueling areas should be kept free of accumulations of fibrous lint, oil, and trash, with particular attention paid to the internal areas of vehicles.

6-2.2* Maintenance and Operations. The following recommendations should be met prior to the entrance or use of industrial trucks in a cotton storage or handling area:

(a) All traces of fuel should be cleaned from the vehicle before it is started.

(b) Vehicles that have exhausted fuel tanks should be towed to the assigned fueling area for refueling.

(c) Repairs should be prohibited in cotton storage or handling areas.

(d) Alterations of the fire safety features should be prohibited.

(e) Maintenance procedures should comply with those outlined in NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance, and Operation.* (*See 6-2.1.*)

6-2.3 Interplant Haulage. Tractors used for interplant hauling should be equipped with a properly maintained, suitable, spark arrester-type muffler.

6-2.4 Motorized Vehicles. Motorized vehicles, other than those specified under 6-2.1, should not be permitted to enter any cotton storage area. A loading platform should be located so that trucks cannot fully enter inside the closing walls of a warehouse, with the truck space inclined away from the platform and lower than the platform. The loading area should be closed off from any under-floor building space.

6-2.5 Mechanical handling equipment, when not in use, should be stored outside.

6-3 Building Service and Equipment.

6-3.1 Electrical Installation.

(a) It is recommended that cotton storage and handling areas be free of electrical installations; however, installations that are necessary should comply with NFPA 70, *National Electrical Code®*, for Class III, Division 2, hazardous areas.

(b) Electrical extension cords should be prohibited in storage areas. If portable lights are necessary, battery-powered lanterns or flashlights may be permitted to be used.

6-3.2 Open flame heating devices, permanent or temporary, should be prohibited.

6-3.3 Shops and Equipment.

6-3.3.1 Repairing and reconditioning and boilers or similar equipment should be prohibited in cotton storage areas. Separate buildings should be provided for such purposes or should be separated from storage areas by a standard 2-hour fire wall.

6-3.3.2 The term "reconditioning" applies mainly to cotton and is defined as any opening, drying, cleaning, or picking of bales of loose cotton by any means whatsoever.

Exception No. 1: Air drying (not compressed air) of baled cotton at room temperature where not more than one band is removed from each bale being so dried.

Exception No. 2: The picking of baled cotton by hand where not more than five bales are in the process of being picked on the premises at any one time, and where at least two bands remain on each bale so picked. Removal of more than one band is to be considered part of the picking process.

Exception No. 3: The opening of bales in the press room for pressing or recompressing.

Exception No. 4: The cleaning of baled cotton by brushing (manual only) where the process employed does not remove an appreciable quantity of lint.

Mechanical reconditioning operations should confine lint and "fly" to the reconditioning building and should be separated from cotton storage (or compress) by a standard fire wall without openings or by unobstructed clear spaces as outlined in Chapter 2.

6-4 Cutting and Welding.

6-4.1 Where cutting and welding operations are necessary, the precautions contained in NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, should be followed.

6-4.2 Welding, soldering, brazing, or cutting should be permitted only by the authorization of management. Proper precautions should be observed and should include the following:

(a) A supervisor should be assigned to the operation.

(b) The area should be made fire-safe.

(c) Work should be removed to a safe area, where possible.

(d) Where these operations are performed on equipment or building components that cannot be moved, there should be no storage below or within a 35-ft (10.7-m) radius.

(e) Floors should be swept clean and wooden floors wet down within the 35-ft (10.7-m) radius.

(f)* The cutting and welding equipment to be used should be in good operating condition and properly maintained.

(g) Openings and cracks in wood construction should be tightly covered to prevent the passage of sparks.

(h) All cotton bordering the area should be protected by flameproofed covers or otherwise shielded with metal or asbestos guards or curtains. The edges of the covers at the floor should be tight to prevent sparks from escaping. This precaution should extend to where several covers are used to protect a large storage pile.

(i) All fire protection equipment should be in service and ready for immediate use.

(j) A fire watch should be maintained and equipped with a portable extinguisher during these operations for not less than 1 hour following the completion of open flame operation.

6-5* Waste Disposal. Rubbish, trash, and other waste material should be disposed of at regular intervals. Approved waste cans with self-closing covers should be used where needed. Open fires and incinerator operations should be prohibited within 100 ft (30.5 m) of any cotton storage building.

6-6* Smoking. Smoking should be strictly prohibited. "No smoking" signs should be posted conspicuously in prohibited areas.

Exception: Smoking may be permitted in locations prominently designated as safe smoking areas.

6-7 Maintenance and Inspection.

6-7.1 Fire walls, fire doors, fire door guards, and floors should be maintained in good repair at all times.

6-7.2 NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, should be referenced for information on the maintenance and service of sprinkler systems and water supplies.

6-7.3 All portable and manual fire extinguishing equipment should be maintained and serviced.

6-7.4* As an aid in maintaining fire protection features and equipment in full service at all times, Figure A-6-7.4 provides a simple self-inspection form that contains a checklist of loss prevention principles. This sample form can be used without change or as a guide in establishing a specialized form to suit individual facilities. [*See Figure A-6-7.4.*]

6-8 Grass and Weeds. All dried grass and weeds should be kept clear of buildings for at least 50 ft (15.2 m).

Chapter 7 Referenced Publications

7-1 The following documents or portions thereof are referenced within this recommended practice and should be considered part of the recommendations of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

7-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1994 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1994 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 1996 edition.

NFPA 18, *Standard on Wetting Agents*, 1995 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 1995 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 1995 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 1993 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 1992 edition.

NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, 1995 edition.

NFPA 70, *National Electrical Code*, 1996 edition.

NFPA 72, *National Fire Alarm Code*, 1993 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1995 edition.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, 1993 edition.

NFPA 220, *Standard on Types of Building Construction*, 1995 edition.

NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*, 1995 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance, and Operation*, 1992 edition.

NFPA 600, *Standard on Industrial Fire Brigades*, 1996 edition.

NFPA 601, *Standard for Security Services in Fire Loss Prevention*, 1996 edition.

7-1.2 Other Publications.

7-1.2.1 ASTM Publication. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19105.

ASTM E 119, *Standard Methods for Fire Tests of Building Construction and Materials*, 1995.

7-1.2.2 UL Publication. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 263, *Standard for Safety Fire Tests of Fire Resistance of Building Construction and Materials*, 1992.

Appendix A Explanatory Material

This Appendix is not a part of the recommendations of this NFPA document but is included for informational purposes only.

A-1-3 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations that is in a position to determine compliance with appropriate standards for the current production of listed items.

A-1-3 Authority Having Jurisdiction. 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, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A-1-3 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A-2-3.2 For a complete description of construction Types I, II, III, IV, and V, see NFPA 220, *Standard on Types of Building Construction*.

A-3-1 One building, compartment, or section classed as a fire division should not contain more than 10,000 bales of cotton if protected by a sprinkler system in accordance with Chapter 4, nor more than 5000 bales if not so protected. (*See Section 2-3.*)

A-4-1.3.5 Limited tests and actual fire experience indicate an initial low heat release; thus, sprinklers in the ordinary temperature range should offer some advantage by opening faster than those of intermediate or high temperature classifications under similar conditions.

A-4-6.4 For further information, see NFPA 13E, *Guide for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*.

A-5-6 In the case of buildings, sprinklered or unsprinklered, the clear space may be permitted to be reduced up to 50 percent if construction is fire-resistive or if facing walls are masonry and parapeted with adequately

Table A-1-3 Typical Cotton Bale Types and Approximate Sizes

Bale Type	Dimensions (in.)	Dimensions (mm)	Avg. Wt. (lb)	Avg. Wt. (kg)	Volume (ft^3)	Volume (m^3)	Density (lb/ft^3)	Density (kg/m^3)
Gin, flat	55 × 45 × 28	1397 × 1143 × 711	500	226.8	40.1	1.13	12.5	201
Modified gin, flat	55 × 45 × 24	1397 × 1143 × 610	500	226.8	34.4	0.97	14.5	234
Compressed, standard	57 × 29 × 23	1448 × 736 × 584	500	226.8	22.0	0.62	22.7	366
Gin, standard	55 × 31 × 21	1397 × 787 × 533	500	226.9	20.7	0.58	24.2	391
Compressed, universal	58 × 25 × 21	1475 × 635 × 533	500	226.8	17.6	0.50	28.4	454
Gin, universal	55 × 26 × 21	1397 × 660 × 533	500	226.8	17.4	0.49	28.7	463
Compressed, high density	58 × 22 × 21	1473 × 559 × 533	500	226.8	15.5	0.44	32.2	515

WAREHOUSE NO.	COMPARTMENT NO.

General Housekeeping	YES	NO
1. Inside Buildings		
(a) Floor and dock areas clean of loose cotton and trash?	☐	☐
(b) Covered metal containers for loose cotton and trash?	☐	☐
2. Outside Buildings		
(a) Surrounding areas free of dried grass, weeds, and combustible trash?	☐	☐
Smoking		
(a) Evidence of smoking in unauthorized areas?	☐	☐
(b) Signs posted and readily visible?	☐	☐
Electrical Equipment		
(a) Extension cords prohibited?	☐	☐
(b) Storage in contact with lights or wiring?	☐	☐
(c) Wiring properly supported and undamaged?	☐	☐
(d) Circuits properly fused?	☐	☐
(e) All panels, junction, switch, and receptacle boxes covered?	☐	☐
Mechanical Equipment		
(a) Listed for fiber storage (Type DS, DY, ES, EE, EX, GS, or LPS)?	☐	☐
(b) Spark-retardant mufflers maintained?	☐	☐
(c) Refueled outside at designated area?	☐	☐
(d) Stored outside when idle?	☐	☐
(e) General condition and maintenance good?	☐	☐
Buildings		
(a) Fire walls in good repair, including around fire door openings?	☐	☐
(b) Fire doors in proper working condition and tested for ease of closing each week? (Overhead, roll-type doors should be tested at least annually.)	☐	☐
(c) Fire door guards in place and maintained?	☐	☐
(d) Floor and exterior walls in good repair?	☐	☐
(e) Exterior wall openings have doors and windows in place that close properly and lock?	☐	☐
(f) Space under grade floor, if any, closed off?	☐	☐
Storage Arrangements		
1. Storage blocks		
(a) Within prescribed height [15 ft (4.6 m)]?	☐	☐
(b) Sprinkler heads unimparied [18-in. (457-mm) clearance]?	☐	☐
(c) Block sizes limited to 700 bales pressed or 350 flat?	☐	☐
(d) Tiered storage stable and secure?	☐	☐
2. Aisles		
(a) At least one main aisle 12 ft (3.7 m) or more in width?	☐	☐
(b) Cross or work aisles at least 4 ft (1.2 m) in width?	☐	☐
(c) Any damaged bales, broken bands, or wet stock?	☐	☐

Fire Department	YES	NO
(a) Phone number prominently displayed at each phone?	☐	☐
(b) Personnel instructed on procedure in case of fire?	☐	☐
Watch Service		
(a) Making regular rounds?	☐	☐
(b) All key stations punched?	☐	☐
(c) Records checked, dated, and filed?	☐	☐
Fire Alarm Service		
(a) Automatic fire alarm system in service?	☐	☐
(b) Manual pull stations clearly marked and accessible?	☐	☐
(c) Date last tested?	☐	☐
Manual Extinguishing Equipment Portable Extinguishers		
1. Hand Units		
(a) Properly placed and accessible?	☐	☐
(b) Recharged within the last year?	☐	☐
(c) All in good condition?	☐	☐
2. Containers and Buckets		
(a) Properly distributed?	☐	☐
(b) Kept full?	☐	☐
(c) Two buckets per barrel?	☐	☐
3. Mobile Equipment		
(a) Properly placed and protected from damage?	☐	☐
(b) Charged and ready for service?	☐	☐
Inside Hose		
(a) Hose and nozzle attached to each?	☐	☐
(b) Racked and in good condition?	☐	☐
(c) Easily accessible and ready for use?	☐	☐
(d) Valves operate readily?	☐	☐
Yard Hydrants and Hose Houses		
(a) Readily accessible?	☐	☐
(b) Hose racked or reeled and in good condition?	☐	☐
(c) Nozzles, spanners, hydrant wrench available?	☐	☐
(d) Hydrants operable?	☐	☐
(e) General condition: Good ☐ Poor ☐		

Note: 1 in. = 25.4 mm; 1 ft = 0.3048 m

REMARKS (Report on any unusual conditions and action taken):

Report by: **Date:**

Figure A-6-7.4 Sample loss prevention self-inspection form for baled cotton storage.

protected openings. This area reduction also may be permitted to be applied to noncombustible buildings of a type limited to corrugated iron or asbestos panel walls and roof on a steel frame.

A-5-7.1.2 Where hose reels are used, they should be able to be pulled easily by two persons.

A-5-8.2 The U.S. Department of Transportation (DOT) has safety jurisdiction over a major segment of the trucking industry, specifically those vehicles used in transportation for interstate or foreign commerce. Reference also should be made to NFPA 512, *Standard for Truck Fire Protection*, which incorporates many requirements of DOT's Federal Motor Carrier Safety Regulations for the benefit of those not subject to DOT safety jurisdiction.

A-6-2.2 Lift trucks are a common cause of fires in cotton warehouses, due mainly to the lack of maintenance and cleanliness and the alteration or improper substitution of fire safety features.

A-6-4.2(f) Personnel operating arc welding or cutting equipment should be protected from possible shock.

A-6-5 For additional details, see NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment.*

A-6-6 The cooperation of employees is more easily secured where a reasonable smoking policy is adopted, with smoking allowed in specified locations where there is little hazard, at specified times, and under suitable supervision. Complete prohibition is likely to lead to surreptitious smoking in out-of-the-way locations where the hazard is most dangerous.

A-6-7.4 See Figure A-6-7.4.

Appendix B Guidelines for Fighting Fires in Baled Cotton

This Appendix is not a part of the recommendations of this NFPA document but is included for informational purposes only.

B-1 Introduction. The information contained in this appendix is a summary of knowledge gained over the years by cotton warehouse personnel, fire fighters, and insurance authorities in fighting fires in the Cotton Belt.

A baled cotton fire has peculiarities that should be understood and respected if a large loss is to be avoided with minimum danger to personnel. Automatic sprinklers, if properly designed and supplied, can be expected to control a baled cotton fire where storage methods outlined in this recommended practice are followed, but extinguishment should not be expected.

The primary rule for any fire is always to call the responding fire department first. Fighting fires of any type is a profession and, even where a well-trained private fire organization is available, professional aid should be effected as soon as possible, and plant personnel should not be unduly exposed to the peril.

The myriad of small fibers that make up a cotton bale, especially a naked bale or one wrapped in burlap, and cover its surface offer a highly vulnerable source of ignition as well as the potential for a rapid flamespread, also known as "flashover." A flashover is usually followed by a slower flamespread at the surface, then tenacious burrowing into the pile between bales and penetration of the interiors of individual bales. High density bales are less vulnerable to a burrowing fire, but the possibility of such a fire should not be ignored.

B-2 Causes. Some of the causes of cotton fiber fires include breaking metal bands (ties) that strike other metallic objects resulting in sparks, fire-packed bales, electrical faults, mechanical equipment (defective lift trucks), friction (bale ties rubbing together, railroad boxcars), lightning, cutting and welding, and smoking. Sparks from bale ties and fire-packed bales appear to be the most prominent fire cause. Incendiarism and exposures are also a consideration.

B-3 Incipient Stage. If caught in the incipient stage, control can often be effected, provided the proper procedures are followed. Portable extinguishing equipment, such as containers and pails, or pressurized or pump-type water units, can be used to wet down the exterior of the bale quickly.

If small extinguishers are not successful, portable, wheeled, wetting agent tanks or standpipe hose, or both, should be used. The last resort is hose streams from outside hydrants. Extreme caution should be exercised when using straight hose streams, as the force of the stream could scatter the burning wads or portions of cotton over a wide area. Spray or fog nozzles are recommended, but, if not available, it might be possible to deflect a solid stream off the walls, roof, or other solid object.

Once the exterior of the bale(s) is fully wet down and fire is suppressed, the bales involved then should be removed to an outside, safe location for final extinguishment.

CAUTION: An obviously burning bale should never be dragged or mechanically moved down aisles, as this is likely to spread the fire to bales bordering the aisle. (*See Section B-9.*)

B-4 Active Stage in Sprinklered Buildings. If a fire progresses well beyond the incipient stage or involves more than a few bales and further firespread is likely, the building could readily prove untenable and dense smoke could quickly obscure vision. It then is best to have all personnel vacate the building to a point of safety. As drafts, including early venting through roofs and walls, are undesirable, it is essential to leave the building unventilated and close all doors and cut off all possible drafts to the building or section involved. This reduces available oxygen to the fire, and the dense smoke suppresses fire intensity. Drafts not only provide fresh air to increase fire intensity but also can blow heat away from the fire, opening sprinklers beyond the fire area and possibly overtaxing the available water to the sprinkler system.

The sprinkler system should be given a chance to do its job. DO NOT VENTILATE! Ventilating a cotton fire can cause it to flash out of control, spread with explosive violence, and open an excessive number of sprinklers.

After the fire is under control of the sprinkler system, the compartment door should be opened only enough to use fire hose or to enter and remove the cotton. The smoldering bales should be removed to the outside as soon as possible for individual attention. Extreme caution should be exercised when entering a fire area. Entry should be on the downwind side, if possible, to avoid creating draft conditions that could cause the fire to reignite. It is important to remain alert for gas explosions. If the fire appears to flare up again, the building should be vacated immediately

and the doors again should be closed tightly and the sprinkler system should be allowed to regain control.

B-5 Sprinkler Failure. If the sprinkler system fails to maintain fire control, then hose streams should be used, preferably through door openings only large enough for the hose.

Where it is apparent that the fire is beyond the control of the sprinklers and the building is nearing the point of collapse, the control valve(s) to the sprinkler systems in the building or section involved should be shut off to conserve water for hose stream use.

B-6 Active Stage in Nonsprinklered Buildings. Immediately on arrival at the fire, all openings to the compartment involved should be closed.

As many hose lines as possible, preferably supplied with a wetting agent, should be available.

The doors should be opened only enough to allow the use of the hose in a spray-like fashion. Caution should be exercised to open these doors slowly to minimize the chance of an explosion. The doors on the opposite sides of the compartment should not be opened, which would allow a cross-draft. Only the door on the lee side, and not the windward side, of the building should be opened.

B-7 Cotton Yard Fires. Conditions in a cotton yard fire are not as controllable as those in a warehouse fire, since draft conditions are almost entirely dependent upon the climatic conditions at the time of the fire; and, if an adverse wind prevails, a small involvement can easily become a catastrophe. Preplanning is particularly important in this case. Upon arrival at a cotton yard fire, the following steps should be taken immediately:

(a) If available, fire department connection to the hydrants should be utilized.

(b) Hose lines should be laid out.

(c) Using divided stream nozzles, water should be applied ahead and downwind of the fire and then worked toward the fire.

(d) Bales and dunnage should be checked underneath for fire.

(e) It is important to remain alert for flying sparks.

(f) The nearby uninvolved cotton should be removed to create a fire break.

(g) Burned cotton should be removed to a segregated area.

B-8 After Watch. Where the fire-involved cotton has been removed and leaves behind undamaged stock, a minute and unobserved spark often causes a rekindling of the previous fire with disastrous results. The involved area should be inspected and carefully cleaned. Hose lines and fire department watch should be maintained until the area is known to be safe. Before leaving the scene of the fire, responsible plant personnel should be advised that after watch should be kept for at least 24 hours. One of the most disastrous fires on record could possibly have been prevented with adequate after watch following a minor involvement.

B-9 Salvage Operations. Salvage is important, and every precaution should be taken to protect the salvage. The usual severity of a fire in a cotton warehouse, along with the appearance of the charred bales, is misleading with respect to the amount of remaining salvage.

Water does not damage cotton, and if the charred bales are kept cool with hose streams until proper salvage operation is begun, the quantity of the loss can be reduced substantially.

After the fire is brought under control, all bales involved should be removed to a safe outside location as quickly as possible and practicable. Each bale then should be handled individually in order to effect complete extinguishment. This is best accomplished by the use of small hose lines or barrels and buckets, using a wetting agent known as wet water.

WARNING: DO NOT REMOVE THE BANDS OR WIRES FROM THE BALES. To do so exposes more lint to the fire and threatens the loss of the entire bale.

Salvage crews should be ready to move the cotton out of the involved shed as rapidly as possible. *Extreme* caution should be exercised in preparing and watching the path along which the burned bales are removed from the involved shed. Burning fibers of cotton are easily blown from the bale, especially in the haste and excitement of moving the bales outside. It might be necessary to move the uninvolved bales away from the exit route (or from the entire compartment) or even to make a hole in the side of the compartment. The spread of fire along the exit route caused by burning bales is not uncommon! The burning bales should be wetted down and moved to a safe, segregated place as soon as possible for individual attention.

The following are steps to be taken in the salvage operation:

(a) An open area, without exposures, into which the burning bales can be moved should be selected.

(b) A salvage crew should be stationed at the yard.

(c) A good supply of wetting agent should be available.

(d) A good supply of water should be available.

(e) Containers, pails, and stirrup pump-type extinguishers should be available, filled with wet water.

(f) Burning bales should be wet down and removed from the fire area as soon as possible. They should be placed approximately 3 ft (0.9 m) apart in an open area away from other exposures.

(g) Care should be exercised in removing these bales so as not to start another fire in the process. If the side of the compartment is metal-clad or frame, it might be best to remove a portion of the side so that the cotton can be removed. Some warehouse personnel take the time to remove cotton from those compartments through which the burning bales travel before salvage operations are allowed to start. If there is any question regarding additional exposures, they should be removed, if possible, before moving the burning bales.

(h) Any outside blaze on the bale should be knocked down. The wet water should be applied to each smoldering spot on the bale. Often a handful of cotton soaked in the wet water can be applied directly on or into the smoldering spot. Cotton fires burrow into the bale, so it is necessary to apply the wet water as far into the hole as possible, soaking the area thoroughly. In order to be certain the fire is out, the burned cotton should be removed from each hot spot while applying wet water to the hole. When the area around the spot is no longer warm, it can be assumed that the fire has been extinguished.

(i) The bands from the bales should not be removed. To do so exposes more lint to the fire, and the bale will probably be a complete loss.

(j) Bales involved in a fire should be closely watched for at least 5 days after the last spark is believed to have been extinguished.

B-10 Fire-packed Bales. During the cotton ginning operation, sparks, caused by stones, metal, or other foreign objects in the seed cotton striking metal parts of the gin, can ignite the fibers. Occasionally, a fire immediately erupts, but often the smoldering lint is carried onto the press box where it can be packed, undetected, into the bale. Usually the fire burns through to the outside of the bale within a few hours, but it can remain undetected for several days. Sometimes the odor is noticeable or the bale feels excessively warm.

These bales are known as fire-packed bales and are a major cause of fires in baled cotton.

The recommended procedure for handling and extinguishing fire-packed bales is as follows:

(a) All known or suspect fire-packed bales should be stored in the open and segregated from buildings and other storage. They should be separated about 3 ft (0.9 m) from other such bales.

(b) These bales should be under constant surveillance to detect fire as soon as it moves to the surface.

(c) A supply of an approved wetting agent and at least one stirrup pump should be available at all times.

(d) When fire is detected, the area around the hot spot should be wetted immediately to prevent the spread of the fire. The hot spot then should be saturated with wet water. The burned cotton should be removed by hand while constantly applying water to the hole. This procedure should be continued until no warm areas are detected. It is not uncommon for several fires to be packed into a single bale.

(e) DO NOT REMOVE THE BANDS FROM THE BALE, as this exposes more cotton fibers to ignition and usually results in the total loss of the bale.

(f) Fire-packed bales or bales suspected of being fire-packed should remain in quarantine and under surveillance for at least 5 days. After this time, they can be considered to be safe and handled in the regular manner.

NOTE: There is no set time after which a fire can be considered extinguished in a bale, as this depends on the thoroughness of extinguishment. However, 5 days after the fire is believed to have been extinguished is generally considered to be a rule of thumb safe period.

Appendix C Referenced Publications

C-1 The following documents or portions thereof are referenced within this recommended practice for informational purposes only and thus are not considered part of the recommendations of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

C-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 13E, *Guide for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems*, 1995 edition.

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, 1994 edition.

NFPA 220, *Standard on Types of Building Construction*, 1995 edition.

NFPA 512, *Standard for Truck Fire Protection*, 1994 edition.

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The NFPA Codes and Standards Development Process

Since 1896, one of the primary purposes of the NFPA has been to develop and update the standards covering all areas of fire safety.

Calls for Proposals
The code adoption process takes place twice each year and begins with a call for proposals from the public to amend existing codes and standards or to develop the content of new fire safety documents.

Report on Proposals
Upon receipt of public proposals, the technical committee members meet to review, consider, and act on the proposals. The public proposals – together with the committee action on each proposal and committee-generated proposals – are published in the NFPA's Report on Proposals (ROP). The ROP is then subject to public review and comment.

Report on Comments
These public comments are considered and acted upon by the appropriate technical committees. All public comments – together with the committee action on each comment – are published as the Committee's supplementary report in the NFPA's Report on Comments (ROC).

The committee's report and supplementary report are then presented for adoption and open debate at either of NFPA's semi-annual meetings held throughout the United States and Canada.

Association Action
The Association meeting may, subject to review and issuance by the NFPA Standards Council, (a) adopt a report as published, (b) adopt a report as amended, contingent upon subsequent approval by the committee, (c) return a report to committee for further study, and (d) return a portion of a report to committee.

Standards Council Action
The Standards Council will make a judgement on whether or not to issue an NFPA document based upon the entire record before the Council, including the vote taken at the Association meeting on the technical committee's report.

Voting Procedures
Voting at an NFPA Annual or Fall Meeting is restricted to members of record for 180 days prior to the opening of the first general session of the meeting, except that individuals who join the Association at an Annual or Fall Meeting are entitled to vote at the next Fall or Annual Meeting.

"Members" are defined by Article 3.2 of the Bylaws as individuals, firms, corporations, trade or professional associations, institutes, fire departments, fire brigades, and other public or private agencies desiring to advance the purposes of the Association. Each member shall have one vote in the affairs of the Association. Under Article 4.5 of the Bylaws, the vote of such a member shall be cast by that member individually or by an employee designated in writing by the member of record who has registered for the meeting. Such a designated person shall not be eligible to represent more than one voting privilege on each issue, nor cast more than one vote on each issue.

Any member who wishes to designate an employee to cast that member's vote at an Association meeting in place of that member must provide that employee with written authorization to represent the member at the meeting. The authorization must be on company letterhead signed by the member of record, with the membership number indicated, and the authorization must be recorded with the President of NFPA or his designee before the start of the opening general session of the Meeting. That employee, irrespective of his or her own personal membership status, shall be privileged to cast only one vote on each issue before the Association.

Sequence of Events Leading to Publication of an NFPA Committee Document

Call for proposals to amend existing document or for recommendations on new document.

▼

Committee meets to act on proposals, to develop its own proposals, and to prepare its report.

▼

Committee votes on proposals by letter ballot. If two-thirds approve, report goes forward. Lacking two-thirds approval, report returns to committee.

▼

Report is published for public review and comment. (Report on Proposals - ROP)

▼

Committee meets to act on each public comment received.

▼

Committee votes on comments by letter ballot. If two-thirds approve, supplementary report goes forward. Lacking two-thirds approval, supplementary report returns to committee.

▼

Supplementary report is published for public review. (Report on Comments - ROC).

▼

NFPA membership meets (Annual or Fall Meeting) and acts on committee report (ROP and ROC).

▼

Committee votes on any amendments to report approved at NFPA Annual or Fall Meeting.

▼

Complaints to Standards Council on Association action must be filed within 20 days of the NFPA Annual or Fall Meeting.

▼

Standards Council decides, based on all evidence, whether or not to issue standard or to take other action, including hearing any complaints.

▼

Appeals to Board of Directors on Standards Council action must be filed within 20 days of Council action.