

**U.S. CODES APPLICABLE TO BALED COTTON STORAGE –
REVISION OF CODES AND STANDARDS: INTERNATIONAL
CODE COUNCIL AND NATIONAL FIRE PROTECTION ASSOCIATION**

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Abstract

In 2000 three local sets of regional codes (developed by BOCA, SBCCI and ICBO), which are adopted by the various local jurisdictions into regulations, were merged into one, under the umbrella of the International Code Council (ICC). ICC now issues a building code (IBC), a fire code (IFC) and a number of other codes. The National Fire Protection Association (NFPA) issued their own building code (NFPA 5000) in 2002, to accompany their existing Life Safety Code (NFPA 101) and Uniform Fire Code (NFPA 1). Both organizations revise their codes on a periodic basis (every 3 years). NFPA 230 (Standard for Fire Protection of Storage) Annex D (Protection of Baled Cotton) and NFPA 13 (Standard for the Installation of Sprinkler Systems) also apply to storage of baled cotton and will need to be amended. These codes and standards could have a severe impact on any new construction or occupancy changes involving warehouses that store baled cotton.

Background

In 2000 the three local sets of regional codes, Building Officials & Code Administrators International (BOCA), International Conference of Building Officials (ICBO), and Southern Building Code Congress International (SBCCI), which are adopted by the various local jurisdictions into regulations, were merged into one, under the umbrella of the International Code Council (ICC), which now issues a building code (IBC), a fire code (IFC) and a number of other codes. They have already issued 2 editions of their codes: 2000 and 2003. The National Fire Protection Association (NFPA) issued their own building code (NFPA 5000) in 2002, to accompany their existing Life Safety Code (NFPA 101) and Uniform Fire Code (NFPA 1). In July 2003 California adopted the NFPA 5000 and NFPA 1 codes statewide (Nicholson, 2003). Table 1 below list the Cotton Producing States and the Codes presently in force in those states.

The ICC and NFPA work in parallel, and there is no direct tracking of information from one to the other: requirements in an NFPA code (whether NFPA 1 or NFPA 5000) could be very different from that in an ICC code (whether IBC or IFC). Almost all states and jurisdictions will adopt one of the two competing building codes (IBC or NFPA 5000) and one of the two competing fire codes (IFC or NFPA 1). Some jurisdictions will also adopt some other documents, such as the Life Safety Code (NFPA 101), the standard for the protection of storage (NFPA 230) or the sprinkler installation standard (NFPA 13) as part of their regulations. Adoption is usually by reference to the latest published edition of a document. As it now stands these codes and standards could have a severe impact on any new construction or occupancy changes involving Warehouses that store baled cotton. NFPA 230 (Standard for the Fire Protection of Storage), contains Appendix D (Protection of Baled Cotton History of Guidelines), which is not part of the requirements of NFPA 230 but is used as justification for much of the requirements associated with the storage of cotton bales. NFPA 101 (life safety code) and NFPA 13 [Standard for the Installation of Sprinkler Systems; Chapter 12 (storage) addresses baled cotton storage] will also need to be revised to be consistent with the revisions of these other standards. NFPA 231E, the old standard for baled cotton storage has now been incorporated into NFPA 230, Standard for the Fire Protection of Storage, as informational Appendix D. There does not appear to be much change between the information in the Appendix of NFPA 230 and what was in the standard NFPA 231E, with which we were used to working.

Under the 2003 IBC and IFC cotton fibers are classified as “combustible fibers”, and thus as a “hazardous material”. If baled cotton is assigned to this High Hazard Group 111 Combustible Fiber, special requirements go into effect for any new construction or occupancy change. These requirements include different types of construction, in terms of fire rating of walls and floors as well as sprinkler requirements. Any baled cotton storage exceeding 1000 ft³ (51 bales) will fall into this group and the following requirements would then go into effect:

1. Occupancy Permit must be issued before 1000 ft³ or more of baled cotton can be stored.
2. Automatic Sprinkler Protection will be required when 1000 ft³ or more of baled cotton is stored.
3. All “Hot Work” within the building must be permitted.

4. Automatic Smoke Venting will be required for Buildings exceeding 15000 ft².

5. Building Size Limitations:

a. Type 2A 26,500 to 46,375 ft²

b. Type 2B 14,000 to 24,500 ft²

Note: Type 2A construction requires a 1hr. fire rating on all structural members.

Type 2B Construction is unprotected steel.

There have **not** been any changes in the sprinkler density requirements or life safety code requirements. There have been changes to the codes pertaining to warehouses storing baled cotton.

The new code will impact Bale Cotton Warehouse business in two main areas:

1. Difficulty in getting Occupancy Permits for new and existing buildings.
2. Increased cost of construction by as much as 40%. For example, there is a 1 hr fire protection requirement (can be obtained by using two pieces of 5/8 in. coated sheetrock or by using a sprayed on fire retardant).

Proposals to Change NFPA 5000, 1, 101 & 230

The purpose for attempting to get changes to the IBC/IFC and NFPA codes is to prevent unnecessary new requirements for storage of baled cotton that could greatly affect the cost and other aspects of the storage of densely baled cotton (about 99.9% of US cotton). The codes are presently based on historical anecdotal information, which is not supportable by science. The goal is to change the codes to be consistent with the science and get densely packed baled cotton reclassified from high hazard. The storage requirements for baled cotton that warehouses are used to will not be changed. The proposals submitted to NFPA 10/03 and 1/04 mainly address definitions, which should be consistent in the NFPA and IBC/IFC codes. [This process will take a minimum of 3-4 years if the initial sets of proposals are successful. See Table 1 for time-line.]

Loose cotton or loosely baled cotton, *commonly referred to as “flat or modified flat bales”*, is a different potential fire hazard than densely packed cotton (>20 lbs/ft³), *commonly referred to as “gin standard density or gin universal density bales”*. The intent of the cotton industry is to get the codes to recognize that densely baled cotton bales are not flammable solids that require any special handling. *This has already been recognized by the International Maritime Organization (IMO) and the U.S. Dept. of Transportation (DOT)*. In 1999 as a result of industry actions IMO and DOT removed the Class 4.1 flammable solid classification from baled cotton so that there are no special requirements (e.g., hazardous papers) for all forms of shipment of baled cotton (49 CFR 172.101 [cotton] and 172.102 [note 137]).

Research Basis for Code Changes

The former NFPA 231E, Recommended Practices for the Storage of Baled Cotton, was developed by a consensus of a test group formed in 1978. Little data were found on fire experience for baled fiber other than cotton, and those *data were largely empirical in nature*. The recommendations were limited to cotton fiber in baled form with the intent to convert to a standard as field experience became available to further substantiate its content. In 1978 and before the information was based on flat bales which are much less dense than gin standard or gin universal density bales (<14 lbs/ft³ vs. >22 lbs/ft³). With the merger of a number of NFPA general storage standards in 1999, the information was edited and is now in Annex D of NFPA 230 as guidance for the user (i.e., not a requirement but for informational purpose only).

The extensive research in the 1990's by USDA and others investigated the flammability of densely packed cotton bales. That research was the basis for the IMO and DOT actions and was submitted to DOT in a petition from the industry and subsequently has been published in what is considered the best peer reviewed flammability journal (Wakelyn and Hughs, 2002). Using the results of this research it was concluded by the IMO (International Maritime Organization, Sub-committee on Dangerous Goods, Solid Cargo and Containers, Amendment 29 to the IMDG Code, *Amendment to Schedule Class 4.1, Cotton, Dry.*) and the DOT (49 CFR 172.101& 102) that bales of cotton packaged in accordance with ISO 8115 (compressed to a density of about 360 kg/m³ [22.4 lb/ft³]) and as presently packaged in the U.S. should not be considered a flammable solid. This study found that tests performed on UD bales and small cotton bales of varying densities indicate that an internal smoldering fire (fire-packed bale) does not spread but self extinguishes. This is true even when the fire's source is within 1.27 cm (0.5 in) of the surface of the miniature bales if the bale density is > 225kg/m³ (>14 lb/ft³). Actual tests, as well as other technical information, indicate that cotton is not a self-heating substance and does not self-ignite (spontaneous combustion) unless it is contaminated with significant amounts of a self heating substance (e.g., an oxidizable oil/self heating oil); wet bales cannot self-ignite. Severe flammability tests (CA TB 129, a test to evaluate mattresses for arson-like fires) conducted on full-size bales generated data verifying cotton's minimal risk when packaged in universal density [UD; compacted to 353.6 kg/m³ (22 lbs/ft³) or greater] bales. Intake densely compressed bales of cotton also passed ASTM standard cigarette and match tests.

Summary

NCC and other organizations are working to amend the IBC/IFC and NFPA codes and associated documents in the areas that pertain to the storage of baled cotton. The purpose for attempting to get changes to the IBC/IFC and NFPA codes is to prevent unnecessary new requirements for storage of baled cotton that could greatly affect the cost and other aspects of the storage of densely baled cotton. The IMO and DOT have already concluded that bales of cotton packaged in accordance with ISO 8115 and as presently packaged in the U.S. should not be considered a flammable solid and thus, that densely baled cotton is different in flammability propensity than loose fiber. The process is expected to take a minimum of 3-4 years. Table 1 gives a time-line for when the various codes consider amendments, and the NCC project started in time for amendments to all the NFPA codes and standards, and for amendments to the second revision (2003 edition) of the IBC/IFC codes.

Recommendations for New Warehouse Construction

1. Identify and contact local code enforcing officials who can help you determine which codes are in affect for your area.
2. Before construction begins, confirm what code requirements and limitations will be placed on your construction project; and
3. Contact your Insurance Carrier to see if they have any special requirements that are not covered by existing codes.

The requirements for storage of baled cotton that the insurance companies have used for the past 25 years and more will not be changed by these actions.

References

Nicholson, J. 2003. California Bound – NFPA guides California after it adopts NFPA 5000 and NFPA 1. NFPA Journal Nov./Dec.

Wakelyn, P.J. and S.E. Hughs. 2002. Evaluation of the flammability of cotton bales. *Fire and Materials* 26, 183-189.

Table 1. Cotton Producing States and the Codes Presently in Force.

Alabama	1999 Standard Building & Fire Code
Arizona	2000 IBC, UFC Fire Code
Arkansas	2000 IBC, 2000 IFC
California	Adopted NFPA 2003
Florida	2000 IBC, 2000 IFC
Georgia	2000 IBC, 2000 IFC
Kansas	1997 Uniform Building Code
Louisiana	1991 Standard Building Code
Mississippi	1999 Standard Building Code
Missouri	No State Mandated Plan
New Mexico	1996 Uniform Building Code
North Carolina	Adopted IBC,IFC 2003
Oklahoma	No state Mandated Code; can pick any code
South Carolina	Intends to Adopt IBC, IFC 2003
Tennessee	1999 Standard Building Code, 2000 NFPA 1
Texas	2000 IBC, 2000 IFC
Virginia	2000 IBC, 2000 IFC

Table 2. Codes and Standards Time Line - Baled Cotton Storage Revisions.

NFPA 1 - Uniform Fire Code - 2005 Edition

Proposal Closing Date: 1/5/2004 – ***Proposals made***
Report on Proposals Mailing Date: 7/23/2004
Comment Closing Date: 10/1/2004
Report on Comments Mailing Date: 4/1/2005
Membership Meeting: May 22-26, 2005, Indianapolis, IN
Revised Edition Date: 2005

NFPA 101 - Life Safety Code - 2005 Edition

Proposal Closing Date: 10/17/2003 - ***Proposals made***
Report on Proposals Mailing Date: 7/23/2004
Comment Closing Date: 10/1/2004
Report on Comments Mailing Date: 4/1/2005
Membership Meeting: May 22-26, 2005, Indianapolis, IN
Revised Edition Date: 2005

NFPA 5000 - Building Code - 2005 Edition

Proposal Closing Date: 10/17/2003 - ***Proposals made***
Report on Proposals Mailing Date: 7/23/2004
Comment Closing Date: 10/1/2004
Report on Comments Mailing Date: 4/1/2005
Membership Meeting: May 22-26, 2005, Indianapolis, IN
Revised Edition Date: 2005

NFPA 230 - Uniform Fire Code - 2005 Edition

Proposal Closing Date: 1/5/2004 – ***Proposals made***
Report on Proposals Mailing Date: 7/23/2004
Comment Closing Date: 10/1/2004
Report on Comments Mailing Date: 4/1/2005
Membership Meeting: May 22-26, 2005, Indianapolis, IN
Revised Edition Date: 2005

NFPA 13 – Standard for the Installation of
Sprinkler Systems (Chapter 12 Storage)

Proposal Closing Date: Nov. 5, 2004
Report on Proposals Mailing Date: 7/29/2005
Comment Closing Date: 10/7/2005
Report on Comments Mailing Date: 3/31/2006
Membership Meeting: May 2006
Revised Edition Date: 2006

International Building Code -

IBC - 2003 Edition - First Revision

International Fire Code -

IFC - 2003 Edition - First Revision

Proposal Closing Date: March 24, 2003
Monograph on Proposals Publication: July 3, 2003
Hearings: September 5-14, 2003, Nashville, TN
Report on Hearings: 11/14/2003
Public comments closing date: 1/14/2004
Monograph on Comments Publication: 4/1/2004
Public Hearings Final Action: May 17-20, 2004, Overland Park, KS

International Building Code -

IBC - 2003 Edition - Second Revision

International Fire Code -

IFC - 2003 Edition - Second Revision

Proposal Closing Date: August 20, 2004
Monograph on Proposals Publication: December 21, 2004
Hearings: February 21-March 2, 2005, Cincinnati, OH
Report on Hearings: 5/2/2005
Public comments closing date: 6/17/2005
Monograph on Comments Publication: 8/24/2005
Public Hearings Final Action: September 27-30, 2005, location not set yet