NFPA 1124

Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

2003 Edition

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

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING THIS DOCUMENT

Notice and Disclaimer of Liability Concerning the Use of NFPA Documents

NFPA codes, standards, recommended practices, and guides, of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards.

The NFPA disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this document available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does the NFPA list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

Important Notices and Disclaimers continued on inside back cover.

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA DOCUMENTS

(Continued from inside front cover)

ADDITIONAL NOTICES AND DISCLAIMERS

Updating of NFPA Documents

Users of NFPA codes, standards, recommended practices, and guides should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of Tentative Interim Amendments. An official NFPA document at any point in time consists of the current edition of the document together with any Tentative Interim Amendments and any Errata then in effect. In order to determine whether a given document is the current edition and whether it has been amended through the issuance of Tentative Interim Amendments or corrected through the issuance of Errata, consult appropriate NFPA publications such as the National Fire Codes Subscription Service, visit the NFPA website at www.nfpa.org, or contact the NFPA at the address listed below.

Interpretations of NFPA Documents

A statement, written or oral, that is not processed in accordance with Section 6 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Patents

The NFPA does not take any position with respect to the validity of any patent rights asserted in connection with any items which are mentioned in or are the subject of NFPA codes, standards, recommended practices, and guides, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on these documents. Users of these documents are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

NFPA adheres to applicable policies of the American National Standards Institute with respect to patents. For further information, contact the NFPA at the address listed below.

Laws & Regulations

Users of these documents should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of its codes, standards, recommended practices, and guides, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

Adoption by Reference. Use of NFPA documents for regulatory purposes should be accomplished through adoption by reference. The term "adoption by reference" means the citing of title, edition and publishing information only. Any deletions, additions, and changes desired by the adopting authority should be noted separately in the adopting instrument. In order to assist NFPA in following the uses made of its documents, adopting authorities are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. For technical assistance and questions concerning adoption of NFPA documents, contact NFPA at the address below.

For Further Information

All questions or other communications relating to NFPA codes, standards, recommended practices, and guides and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA documents during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

For more information about NFPA, visit the NFPA website at www.nfpa.org.

NFPA 1124

Code for the

Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

2003 Edition

This edition of NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles*, was prepared by the Technical Committee on Pyrotechnics 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 1124 was approved as an American National Standard on January 17, 2003.

Origin and Development of NFPA 1124

NFPA 44A was originally developed by the Technical Committee on Explosives of the NFPA Committee on Chemicals and Explosives. It was adopted as a Tentative Code at the 1972 NFPA Annual Meeting. It was further revised and officially adopted at the 1973 NFPA Annual Meeting. A revised edition was adopted in 1974.

In 1980, the Technical Committee on Explosives and the Committee on Pyrotechnics voted to transfer responsibility for NFPA 44A to the Committee on Pyrotechnics. The Correlating Committee on Chemicals and Explosives concurred and petitioned the NFPA Standards Council to effect the change. The Standards Council approved the change in June 1981.

The 1984 edition of NFPA 1124 was the result of a complete review of the 1974 edition of NFPA 44A by the Committee on Pyrotechnics, including the redesignation of the document as NFPA 1124 for consistency with the designations for other documents relating to pyrotechnics.

The 1988 edition of NFPA 1124 was the result of a thorough review of and partial revision to the 1984 edition of NFPA 1124 by the Technical Committee on Pyrotechnics, including reference updating and incorporation of the latest separation distances as approved by the Institute of Makers of Explosives in May 1983. It included new provisions for salute manufacturing and storage of salute powder.

The 1995 edition of NFPA 1124 included partial amendments to the document and editorial revisions, improving its ability to be used, adopted, and enforced and making it conform with the NFPA *Manual of Style*. The Committee incorporated the latest separation distances as approved by the Institute of Makers of Explosives in June 1991. The Committee also updated the definitions of fireworks to be consistent with the new terminology used in the U.S. Department of Transportation regulations that incorporated the United Nations shipping designations for fireworks (explosives).

For the 1998 edition, the requirements for fireworks laboratories were clarified by the addition of a definition and clarification of the storage and separation distances that are appropriate for them. The Committee added an appendix that extracts language from the American Pyrotechnics Association Standard 87-1 to provide users of this document with the approved definitions used in the Federal Regulations for fireworks, novelties, and theatrical pyrotechnics.

The 1998 edition incorporated amendments to the separation distances for fireworks manufacturing plants based upon gross weight. Amendments to Chapter 4 clarified the storage requirements for manufacturing facilities and provided requirements for storage at nonmanufacturing facilities such as warehouses and distribution facilities.

In 1999, the NFPA Board of Directors revised its policy in order to permit the Technical Committee on Pyrotechnics to develop provisions for the retail sales and storage of consumer fireworks, subject to Standards Council oversight.

At the same time, the Board reaffirmed its support of the Model Fireworks Law, which, since 1938, prohibits use of consumer fireworks.

Although NFPA's Public Education position continues to advocate against any use of consumer fireworks, it is believed that in the interest of public safety, NFPA standards for the retail sales and storage of consumer fireworks should be available in those jurisdictions where such sales are permitted.

As a result of the Board of Directors decision, the 2003 edition incorporates new provisions dealing with the distribution and retail sales of consumer fireworks. The code now addresses the fire and life safety requirements for construction, siting and separation distances, and storage and display layout for both permanent and temporary consumer fireworks retail sales facilities. It contains a completely revised Chapter 6 on distribution facilities and a new Chapter 7 on consumer fireworks retail sales facilities. The code has also been revised to reflect the NFPA *Manual of Style*.

Technical Committee on Pyrotechnics

Randall W. A. Davidson, *Chair*
Risk International & Associates, CA [SE]

Kenneth L. Kosanke, *Secretary*
PyroLabs, Incorporated, CO [SE]

Dane Boles, Quest Aerospace, Div. of Marvel Enterprises, Inc., AZ [M]
Richard Bowes, Canadian Explosives Research Laboratory/CANMET, Canada [RT]
W. G. Bulifant, III, Dominion Fireworks, Inc., VA [U]
Jose R. Colon, Connecticut Department of Public Safety, CT [E]
Rep. International Fire Marshals Association
John A. Conkling, Chestertown, MD [SE]
Hugh Council, California Dept. of Forestry & Fire Protection, CA [E]
Thomas DeWille, Luna Tech Incorporated, AL [M]
Vernon Estes, Canon City, CO [SE]
Gary A. Fadorsen, Pyrotech International Inc., OH [IM]
Felix J. Grucci, Jr., Fireworks by Grucci, Inc., NY [M]
Garry Hanson, Precocious Pyrotechnics, Inc., MN [M]
Rep. National Fireworks Association
Lansden E. Hill, Jr., E. E. Hill & Son, Inc./Pyro Shows, TN [U]
Alfred J. Hogan, Reedy Creek Improvement District, FL [E]
Robert J. James, City of Bloomington Fire Prevention, MN [E]
Rep. Fire Prevention Code Committee
Bruce E. Kelly, Orem, UT [U]
Rep. Tripoli Rocketry Association, Inc.
John Kitchens, City of Los Angeles Fire Department, CA [E]
Gerald R. Laib, Naval Surface Weapons Center, Code 950X, MD [SE]
J. Patrick Miller, Hardin-Simmons University, TX [U]
Rep. National Association of Rocketry
David J. Pier, MP Associates, Inc., CA [M]
Michael W. Platt, Hinton, WV [M]
Rep. High Power Rocket Manufacturers & Dealers Association
Mary Roberts, Estes Industries, CO [M]
Gary C. Rosenfield, Industrial Solid Propulsion, Inc., NV [M]
David S. Shatzer, U.S. Bureau of Alcohol, Tobacco & Firearms, DC [E]
James R. Souza, Pyro Spectaculars, Inc., CA [U]
John R. Steinberg, Pyrotechnics Guild International, Inc., MD [U]
Charles Weeth, LaCrosse, WI [U]
Rep. La Crosse Skyrockers Inc.
Dan Westcott, Gadsden Fire Department, AL [E]
Rep. NFPA Fire Service Section

Alternates

Diane Arend, California Dept. of Forestry & Fire Protection, CA [E]
(Alt. to H. Council)
Arthur H. Barber, III, Springfield, VA [SE]
(Alt. to V. Estes)
Scott Bartel, Black Sky Research, CA [U]
(Alt. to B. E. Kelly)
Gary E. Brown, Pyro Spectaculars, Inc., CA [U]
(Alt. to J. R. Souza)
Kevin T. Brueckner, Fireworks and Stage FX America, Inc., CA [M]
(Alt. to G. Hanson)
Mark B. Bundick, First Chicago Capital Markets, IL [U]
(Alt. to J. P. Miller)
Steve A. Coman, RES Specialty Pyrotechnics Inc., MN [U]
(Alt. to J. R. Steinberg)
Ettore Contestabile, Canadian Explosives Research Laboratory/CANMET, Canada [RT]
(Alt. to R. Bowes)
Patrick C. Ferguson, Onalaska, WI [U]
(Alt. to C. Weeth)
H. Stephen Frantz, Western Enterprises, Inc., OK [U]
(Alt. to L. E. Hill)
Felix J. (Phil) Grucci, Fireworks by Grucci, Inc., NY [M]
(Alt. to F. J. Grucci)
Julie L. Heckman, American Pyrotechnics Association, MD [M]
(Alt. to APA Rep.)
Larry Mars, MP Associates, Inc., CA [M]
(Alt. to D. J. Pier)
Brennan S. Phillips, U.S. Bureau of Alcohol, Tobacco & Firearms, WA [E]
(Alt. to D. S. Shatzer)
Bill Stine, Quest Aerospace, Div. of Marvel Enterprises, Inc., AZ [M]
(Alt. to D. Boles)
Gerald D. Ward, Bethany Fire & Protection District, IL [E]
(Alt. to D. Westcott)
Lawrence Weinman, Luna Tech/Schneier-Weinman Consultants, AL [M]
(Alt. to T. DeWille)

Nonvoting

Joseph A. Domanico, U.S. Department of the Army, MD [RT]
Patrick M. Race, U.S. Consumer Product Safety Commission, DC [C]
Rosemary Veigel Cooper, U.S. Department of Labor, IL [E]
Rep. Occupational Safety and Health Administration
Gary Zeller, Zeller International, NY

Guy R. Colonna, NFPA Staff Liaison

Committee Scope: This Committee shall have primary responsibility for documents on the manufacture, transportation, and storage of consumer and display fireworks, pyrotechnic special effects, and model and high power rocket motors. This Committee shall have primary responsibility for the use of display fireworks and for model and high power rocketry, and the construction, launching, and other operations that involve model and high power rocket motors. The Committee shall have primary responsibility for documents on the wholesale and retail sale and storage of consumer fireworks.

The Committee does not have responsibility for documents on the use of consumer fireworks by the general public; on the use of pyrotechnic special effects before a proximate audience; on the manufacture, transportation, storage for use of military, automotive, agricultural, and industrial pyrotechnics.

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.

Contents

Chapter 1 Administration **1124**– 6
1.1 Scope **1124**– 6
1.2 Purpose **1124**– 6
1.3 Application **1124**– 6
1.4 Retroactivity **1124**– 7
1.5 Equivalency **1124**– 7
1.6 Enforcement **1124**– 7

Chapter 2 Referenced Publications **1124**– 7
2.1 General **1124**– 7
2.2 NFPA Publications **1124**– 7
2.3 Other Publications **1124**– 7

Chapter 3 Definitions **1124**– 7
3.1 General **1124**– 7
3.2 NFPA Official Definitions **1124**– 8
3.3 General Definitions **1124**– 8

Chapter 4 Manufacturing Operations **1124**–11
4.1 Applicability **1124**–11
4.2 Permit Requirements **1124**–11
4.3 Recordkeeping and Reporting **1124**–11
4.4 Site Security **1124**–11
4.5 Construction **1124**–11
4.6 Magazine Construction — General **1124**–12
4.7 Magazine Construction — Requirements for Specific Types **1124**–13
4.8 Separation Distances and Quantity Tables **1124**–14
4.9 Maximum Number of Occupants and Maximum Quantity Limitations **1124**–19
4.10 Operations **1124**–19
4.11 Fire and Explosion Prevention **1124**–19
4.12 Fire Protection and Emergency Plans **1124**–20
4.13 Testing of Fireworks and Pyrotechnic Articles **1124**–20
4.14 Occupancies **1124**–20
4.15 Training **1124**–20
4.16 Item Construction **1124**–20

Chapter 5 Storage of Display Fireworks, Pyrotechnic Articles, Salute Powder, Pyrotechnic and Explosive Compositions, and Black Powder **1124**–21
5.1 General Requirements **1124**–21
5.2 Storage Within Magazines **1124**–21
5.3 Miscellaneous Safety Precautions **1124**–22
5.4 Requirements for Shipping Buildings for Display Fireworks **1124**–22

Chapter 6 Storage of Consumer Fireworks **1124**–22
6.1 Applicability **1124**–22
6.2 General Requirements For the Storage of Consumer Fireworks **1124**–23
6.3 Permit Requirements **1124**–23
6.4 Construction **1124**–23
6.5 Fire Protection **1124**–24
6.6 Site Requirements **1124**–24
6.7 Separation Distances **1124**–24
6.8 Means of Egress **1124**–24
6.9 Exit Signs and Emergency Lighting **1124**–25
6.10 Electrical Requirements **1124**–25
6.11 Operations **1124**–25
6.12 Housekeeping **1124**–25
6.13 Consumer Fireworks Work Buildings, Rooms, or Areas **1124**–25
6.14 Trailers, Semitrailers, and Metal Shipping Containers **1124**–25

Chapter 7 Retail Sales of Consumer Fireworks ... **1124**–26
7.1 Applicability **1124**–26
7.2 General Requirements for Retail Sales of Consumer Fireworks **1124**–26
7.3 Permit Requirements **1124**–26
7.4 Construction **1124**–27
7.5 Fire Protection **1124**–27
7.6 Site Requirements **1124**–28
7.7 Separation Distances **1124**–28
7.8 Means of Egress **1124**–28
7.9 Exit Signs and Emergency Lighting **1124**–29
7.10 Retail Sales Displays **1124**–30
7.11 Equipment **1124**–31
7.12 Operations **1124**–31
7.13 Records **1124**–32

Chapter 8 Transportation of Fireworks, Pyrotechnic Articles, and Any Component(s) Containing Pyrotechnic or Explosive Materials on Public Highways **1124**–32
8.1 General Requirements **1124**–32

Annex A Explanatory Material **1124**–32

Annex B Magazine Construction **1124**–38

Annex C **Extract from American Pyrotechnics Association Standard 87-1, *Standard for Construction and Approval for Transportation of Fireworks*** **1124**–38

Annex D **Glossary** **1124**–45

Annex E **DOT Explosive Materials Transport Regulations** **1124**–46

Annex F **Sample Ordinance Adopting NFPA 1124** **1124**–48

Annex G **Informational References** **1124**–48

Index **1124**–50

NFPA 1124

Code for the

Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles

2003 Edition

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

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 1 Administration

1.1 Scope. This code regulates the construction, use, and maintenance of buildings and facilities for the following:

(1) The manufacture and storage of fireworks at fireworks manufacturing facilities
(2) The storage of display fireworks, pyrotechnic articles, salute powder, pyrotechnic and explosive compositions, and black powder at other than display sites
(3) The storage of consumer fireworks at distribution facilities
(4) The retail sales and related storage of consumer fireworks in consumer fireworks retail sales facilities and stores
(5) The transportation of fireworks, pyrotechnic articles, and components thereof containing pyrotechnic or explosive materials on public highways

1.2 Purpose. The purpose of this code shall be to improve safety in the manufacture, transportation, and storage of fireworks, pyrotechnic articles, and any component(s) thereof containing pyrotechnic or explosive compositions, and in the distribution and retail sales of consumer fireworks.

1.3 Application. This code shall apply to the manufacture, transportation, and storage of fireworks, pyrotechnic articles, and any component(s) thereof containing pyrotechnic or explosive compositions, and to the distribution and retail sales of consumer fireworks.

1.3.1 This code shall also apply to the following:

(1) Testing of fireworks at a manufacturing facility
(2) Testing of pyrotechnic devices used in the entertainment industry
(3) Testing of any component(s) of fireworks or pyrotechnic devices used in the entertainment industry that contain pyrotechnic or explosive compositions.

1.3.2 Use of This Code. This code is structured in a logical sequence of Chapters 4 through 8 containing specific requirements which are intended to be mutually exclusive unless specifically indicated within a chapter.

1.3.2.1 Chapter 4. Chapter 4 shall apply to the manufacturing of all types of fireworks at manufacturing facilities.

1.3.2.1.1 For the storage of salute powder, pyrotechnic and explosive compositions, and black powder used in the manufacturing of fireworks and for the storage of finished display fireworks and pyrotechnic articles, see Chapter 5.

1.3.2.1.2 For the storage of finished consumer fireworks and pyrotechnic articles classified as explosives, 1.4G (UN 0336, UN 0337, UN 0431, and UN 0432), see Chapter 6.

1.3.2.2 Chapter 5. Chapter 5 shall apply to the storage of salute powder, pyrotechnic and explosive compositions, and black powder used in the manufacturing of fireworks and to finished display fireworks and pyrotechnic articles not classified as explosives, 1.4G (UN 0336, UN 0337, UN 0431, and UN 0432).

1.3.2.3 Chapter 6. Chapter 6 shall apply to the storage of finished consumer fireworks at manufacturing and distribution facilities.

1.3.2.3.1 Chapter 6 shall not apply to the storage of consumer fireworks at consumer fireworks retail sales facilities and stores.

1.3.2.3.2 For the storage of consumer fireworks related to the retail sales of consumer fireworks at consumer fireworks retail sales facilities or stores, see Chapter 7.

1.3.2.4 Chapter 7. Chapter 7 shall apply to the retail sales of consumer fireworks to the public at consumer fireworks retail sales facilities and stores and to the related storage of consumer fireworks at such facilities.

1.3.2.5 Chapter 8. Chapter 8 shall apply to the transportation of fireworks, pyrotechnic articles, and any component(s) containing pyrotechnic or explosive compositions or explosive materials.

1.3.3 This code shall not apply to the use of consumer fireworks by the general public.

1.3.4 This code shall not apply to the display site storage and use of fireworks and pyrotechnic articles conducted in accordance with NFPA 1123, *Code for Fireworks Display*.

1.3.5 This code shall not apply to the transportation of fireworks, pyrotechnic devices used in the entertainment industry, or any component(s) thereof containing pyrotechnic or explosive compositions, where such transportation is under the jurisdiction of the U.S. Department of Transportation (U.S. DOT) or any other national transportation authority.

1.3.6 This code shall not apply to the manufacture, transportation, or storage of model rockets or high power rockets, model rocket motors or high power rocket motors, model rocket motor reloading kits or modules, or high power motor reloading kits or modules, as covered by one of the following codes:

(1) NFPA 1122, *Code for Model Rocketry*
(2) NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*
(3) NFPA 1127, *Code for High Power Rocketry*.

1.3.7 This code shall not apply to the manufacture, transportation, and storage of fireworks by federal and state military agencies.

1.3.8 This code shall not apply to the storage of pyrotechnic devices at the site of use and the use of pyrotechnic special effects in the entertainment industry conducted in accordance with NFPA 1126, *Standard for the Use of Pyrotechnics before a Proximate Audience*.

1.3.9 This code shall not apply to laboratories covered by NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*.

1.3.10 This code shall not apply to the manufacture, transportation, or storage of flammable gases or liquids.

1.3.11 This code shall not apply to fireworks or pyrotechnic articles used in conjunction with flammable gas or flammable liquid special effects conducted in accordance with NFPA 1123, *Code for Fireworks Display*, and NFPA 1126, *Standard for the Use of Pyrotechnics before a Proximate Audience*.

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

1.4.1 Unless otherwise specified, the provisions of this code 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 code. Where specified, the provisions of this code shall be retroactive.

1.4.2 In those cases where the authority having jurisdiction determines, based on clear and convincing evidence, that the existing situation so materially deviates from the requirements of this code that it presents an unacceptable hazard to life or property, the authority having jurisdiction shall be permitted to apply retroactively any portions of this code as are necessary to mitigate the hazard.

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

1.5 Equivalency. Nothing in this code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.6 Enforcement. This code shall be administered and enforced by the authority having jurisdiction designated by the governing authority. *(See Annex F for sample wording for enabling legislation.)*

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this code 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 10, *Standard for Portable Fire Extinguishers,* 2002 edition.

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

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals,* 2000 edition.

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

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

NFPA 80, *Standard for Fire Doors and Fire Windows,* 1999 edition.

NFPA *101®, Life Safety Code®,* 2003 edition.

NFPA 102, *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures,* 1995 edition.

NFPA 204, *Standard for Smoke and Heat Venting,* 2002 edition.

NFPA 230, *Standard for the Fire Protection of Storage,* 2003 edition.

NFPA 256, *Standard Methods of Fire Tests of Roof Coverings,* 1998 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* 2003 edition.

NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers,* 2000 edition.

NFPA 1122, *Code for Model Rocketry,* 2002 edition.

NFPA 1123, *Code for Fireworks Display,* 2000 edition.

NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors,* 2001 edition.

NFPA 1126, *Standard for the Use of Pyrotechnics before a Proximate Audience,* 2001 edition.

NFPA 1127, *Code for High Power Rocketry,* 2002 edition.

2.3 Other Publications.

2.3.1 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Child Safety Act of 1966

Title XI, "Regulation of Explosives, of the Crime Control Act of 1970," 1970.

Title 16, Code of Federal Regulations, Part 1500 and Part 1507, U.S. Consumer Product Safety Commission.

Title 18, United States Code, Chapter 40, "Importation, Manufacture, Distribution, and Storage of Explosive Materials," 1970.

Title 27, Code of Federal Regulations, Part 55, Bureau of Alcohol, Tobacco and Firearms.

Title 29, Code of Federal Regulations, Part 1910.1200, "Hazard Communication," U.S. Department of Labor.

Title 49, Code of Federal Regulations, Part 100 to end, U.S. Department of Transportation.

2.3.2 Institute of Makers of Explosives Publication. Institute of Makers of Explosives, 1120 19th St., NW, Suite 310, Washington, DC 20036-3605.

American Table of Distances, *American Table of Distances for Storage of Explosives,* June, 1991.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this code. 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* Code. A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

3.2.4 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.

3.2.5* 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.

3.2.6 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions.

3.3.1* Aerial Shell. Usually a cylindrical or spherical cartridge containing pyrotechnic material, a long fuse or electric match wires, and a black powder lift charge. [**1126**:1.5]

3.3.2 Airburst. A pyrotechnic device that is suspended in the air to simulate outdoor aerial fireworks shells without producing hazardous debris. [**1126**:1.5]

3.3.3 Area.

3.3.3.1 ***Consumer Fireworks Retail Sales Area.*** The portion of a consumer fireworks retail sales facility or store, including the immediately adjacent aisles, where consumer fireworks are located for the purpose of retail display and sale to the public.

3.3.3.2 ***Process Area.*** An outside area complying with the applicable provisions of this code for a process building that is used for the manufacture of fireworks and pyrotechnic articles.

3.3.4 Artificial Barricade. See 3.3.5.1.

3.3.5 Barricade. A natural or artificial barrier that effectively screens a magazine, building, railway, or highway from the effects of an explosion in a magazine or building containing explosives.

3.3.5.1 ***Artificial Barricade.*** An artificial mound or revetted wall of earth of a minimum thickness of 0.9 m (3 ft).

3.3.5.2 ***Natural Barricade.*** A natural outdoor feature(s), such as hills or trees, with a density sufficient to prevent surrounding exposures that require protection from being seen from a magazine or building containing explosives when the trees are bare of leaves.

3.3.5.3* ***Screen Barricade.*** Any barrier that contains the embers and debris from a fire or deflagration in a process building, thus preventing propagation of fire to other buildings or areas. [**1125**:3.3]

3.3.6 Binary Material. See 3.3.40.1.

3.3.7* Binary System. A two-component pyrotechnic system.

3.3.8 Black Powder. See 3.3.52.1.

3.3.9 Building.

3.3.9.1* ***Bulk Merchandising Retail Building.*** A building where the sales area includes the storage of combustible materials on pallets, in solid piles, or in racks in excess of 12 ft (3.7 m) in storage height. [**101**:3.3]

3.3.9.2* ***Consumer Fireworks Storage Building.*** A building, in which finished consumer fireworks are received, stored, and shipped but in which no manufacturing is performed.

3.3.9.3* ***Consumer Fireworks Work Building, Room, or Area.*** A building, room or area where finished consumer fireworks are picked and packaged into retail packages including assortments or picked and packed into DOT approved packaging, and where related operations are performed.

3.3.9.4* ***Inhabited Building.*** Any building or structure regularly used in whole or part as a place of human habitation.

3.3.9.5* ***Mechanical Building.*** A building that contains mechanical, electrical, air-conditioning, or other equipment and that usually is connected to a process or nonprocess building.

3.3.9.6* ***Mixing Building.*** Any building used primarily for mixing and blending of pyrotechnic compositions.

3.3.9.7* ***Nonprocess Building.*** An office building, a warehouse, or other building or area located in a manufacturing facility in which no fireworks, pyrotechnic or explosive composition, pyrotechnic articles, or components containing pyrotechnic or explosive materials are processed or stored.

3.3.9.8* ***Process Building.*** Any building or any room at a manufacturing facility where fireworks, pyrotechnic articles, or component(s) containing explosive or pyrotechnic compositions are manufactured. A process building is also any building at a manufacturing facility where consumer fireworks are initially packed for shipment.

3.3.9.9 ***Shipping Building.*** A building used for the packing of assorted display fireworks or for the loading of display fireworks onto vehicles for shipment to purchasers.

3.3.9.10 ***Storage Building.*** A building, structure, or facility in which consumer fireworks in any state of processing are stored, but in which no processing or manufacturing is performed.

3.3.9.11* ***Unoccupied Building.*** A building that is normally unoccupied during its entire period of daily operations.

3.3.10 Bulk Merchandising Retail Building. See 3.3.9.1.

3.3.11 Bulk Salute. See 3.3.66.1.

3.3.12 Bulk Salute Powder. See 3.3.52.3.1.

3.3.13 Bullet-Sensitive Explosive Material. See 3.3.40.2.

3.3.14 Common Fireworks. See 3.3.30.1.

3.3.15 Composition.

3.3.15.1 ***Explosive Composition.*** A chemical compound or mixture, the primary or common purpose of which is to produce by explosion.

3.3.15.2 ***Pyrotechnic Composition.*** A chemical mixture that, upon burning, produces visible, brilliant displays, bright lights, or sounds.

3.3.15.3 ***Whistle Composition.*** A pyrotechnic composition that when pressed into a tube with an open end burns in an oscillatory manner to produce an audible effect.

3.3.16 Consumer Fireworks. See 3.3.30.2.

3.3.17 Consumer Fireworks Retail Sales Area. See 3.3.3.1.

3.3.18 Consumer Fireworks Retail Sales Facility. See 3.3.29.1.

3.3.19* Consumer Fireworks Retail Sales Stand. A temporary or permanent building or structure that has a floor area not greater than 74 m^2 (800 ft^2), other than tents, canopies, or membrane structures, that is used primarily for the retail display and sale of consumer fireworks to the public.

3.3.20 Consumer Fireworks Storage Building. See 3.3.9.2.

3.3.21 Consumer Fireworks Work Building, Room, or Area. See 3.3.9.3.

3.3.22* Covered Fuse. A fuse that is protected against accidental ignition by contact with a spark, smoldering item, or small open flame.

3.3.23 Display Fireworks. See 3.3.30.3.

3.3.24 Distribution Facility. See 3.3.29.2.

3.3.25* DOT Approved Packaging. Packaging for fireworks complying with the regulations of the U.S. Department of Transportation (DOT), Title 49, Part 178.

3.3.26 Electric Match. An electric device that contains a small amount of pyrotechnic material that ignites when current flows through the leads and that is used to initiate the burning of pyrotechnics.

3.3.27* Explosive. Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion.

3.3.28 Explosive Composition. See 3.3.15.1.

3.3.29 Facility.

3.3.29.1 ***Consumer Fireworks Retail Sales Facility.*** A permanent or temporary building or structure, consumer fireworks retail sales stand, tent, canopy, or membrane structure that is used primarily for the retail display and sale of consumer fireworks to the public.

3.3.29.2 ***Distribution Facility.*** A place where consumer fireworks are received, stored, picked, packaged and packed into shipping cartons, and shipped to other distribution facilities, manufacturing facilities, or consumer fireworks retail sales facilities or stores.

3.3.29.3* ***Manufacturing Facility.*** A place where manufacturing of fireworks, pyrotechnic articles, or components for these devices is conducted.

3.3.30* Fireworks. Any composition or device for the purpose of producing a visible or an audible effect by combustion, deflagration, or detonation, and that meets the definition of *Consumer Fireworks* or *Display Fireworks* as set forth in this code.

3.3.30.1 ***Common Fireworks.*** See 3.3.30.2, *Consumer Fireworks.*

3.3.30.2* ***Consumer Fireworks (Formerly Known as Common Fireworks).*** Any small fireworks device designed primarily to produce visible effects by combustion or deflagration that complies with the construction, chemical composition, and labeling regulations of the U.S. Consumer Product Safety Commission, as set forth in Title 16, CFR, Parts 1500 and 1507. [**1123**:1.4]

3.3.30.3* ***Display Fireworks (Formerly Known as Special Fireworks).*** Large fireworks articles designed to produce visible or audible effects for entertainment purposes by combustion, deflagration, or detonation.

3.3.30.4 ***Special Fireworks.*** See 3.3.30.3, *Display Fireworks.*

3.3.31 Flame Break. A solid material without holes or other openings, used to retard the spread of flame.

3.3.32 Flashpowder. See 3.3.52.2.

3.3.33* Fuel. In pyrotechnics, anything combustible or acting as a chemical-reducing agent such as but not limited to sulfur, aluminum powder, iron powder, charcoal, magnesium, gums, and organic plastic binders.

3.3.34 Highway. Any public street, public alley, or public road.

3.3.35 Inhabited Building. See 3.3.9.4.

3.3.36 Limited-Combustible Material. See 3.3.40.3.

3.3.37 Magazine. A building or structure, other than an explosives manufacturing building, approved for the storage of explosive materials.

3.3.38* Manufacturing. The mixing, pressing, and loading of explosive or pyrotechnic compositions for the purpose of producing fireworks or pyrotechnic articles.

3.3.39 Manufacturing Facility. See 3.3.29.3.

3.3.40 Material.

3.3.40.1 ***Binary Material.*** See 3.3.7, *Binary System.* [**1126**:1.5]

3.3.40.2* ***Bullet-Sensitive Explosive Material.*** Explosive material that can be detonated by 9.8-g (150-gr) M2 ball ammunition having a nominal muzzle velocity of 824 m/sec (2700 ft/sec) where fired from a 0.30 caliber rifle at a distance of 30 m (100 ft), measured perpendicular.

3.3.40.3 ***Limited-Combustible Material.*** A building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), where tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, and complies with (a) or (b): (a) Materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of ⅛ in. (3.2 mm) that has a flame spread index not greater than 50; and (b) Materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion and of such composition that surfaces that would be exposed by cutting

through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. (Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition shall be considered combustible.) [**220**:2.1]

3.3.40.4 ***Noncombustible Material.*** A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials that are reported as passing ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, shall be considered noncombustible materials. [**220**:2.1]

3.3.40.5* ***Pyrotechnic Material (Pyrotechnic Special Effects Material).*** A chemical mixture used in the entertainment industry to produce visible or audible effects by combustion, deflagration, or detonation. [**1126**:1.5]

3.3.41 Mechanical Building. See 3.3.9.5.

3.3.42 Mixing Building. See 3.3.9.6.

3.3.43 Motor Vehicle. Any self-propelled vehicle, truck, tractor, semitrailer, or truck-trailer combination used for the transportation of freight over public highways. [**495**:3.3]

3.3.44 Natural Barricade. See 3.3.5.2.

3.3.45 Noncombustible Material. See 3.3.40.4.

3.3.46 Nonprocess Building. See 3.3.9.7.

3.3.47* Novelties and Trick Noisemakers. Small devices containing limited amounts of pyrotechnic explosive or composition that produce a visible or an audible effect.

3.3.48* Oxidizer. Usually an oxygen-rich, ionically bonded chemical that decomposes at moderate to high temperatures.

3.3.49 Permanent. As applied to buildings or structures: a building or structure affixed to a foundation on a site and having fixed utility connections, that is intended to remain on the site for more than 180 consecutive calendar days.

3.3.50 Person. An individual, a firm, a copartnership, a corporation, a company, an association, or a joint-stock association, including any trustee, receiver, assignee, or personal representative thereof.

3.3.51 Pest Control Device. An explosive device used to control animal pests.

3.3.52 Powder.

3.3.52.1 ***Black Powder.*** A low explosive consisting of an intimate mixture of potassium or sodium nitrate, charcoal, and sulfur. [**1126**:1.5]

3.3.52.2 ***Flashpowder.*** See 3.3.52.3.

3.3.52.3 ***Salute Powder.*** An explosive composition that makes a loud report when ignited and constitutes the sole pyrotechnic mixture in a salute.

3.3.52.3.1 ***Bulk Salute Powder.*** A quantity of salute powder in an amount exceeding 0.45 kg (1 lb).

3.3.53* Packaged Fireworks Merchandise. A consumer fireworks device or group of consumer fireworks devices that has been packaged within an unperforated container or packaging material by the manufacturer, distributor, or seller for retail display and sale as a unit.

3.3.54 Process Area. See 3.3.3.2.

3.3.55 Process Building. See 3.3.9.8.

3.3.56 Public Conveyance. Any railroad car, streetcar, ferry, cab, bus, airplane, or other vehicle that carries passengers for hire. [**495**:3.3]

3.3.57 Pyrotechnic Article. A pyrotechnic device, other than a device classed as fireworks, for use in the entertainment industry.

3.3.58 Pyrotechnic Composition. See 3.3.15.2.

3.3.59* Pyrotechnic Laboratory. A building or room used for research, development, or testing of chemicals, fireworks, pyrotechnic articles, or components containing explosive or pyrotechnic compositions.

3.3.60 Pyrotechnic Material. See 3.3.40.5.

3.3.61 Pyrotechnic Special Effect. A special effect created through the use of pyrotechnic materials and devices. *(See also D.1.42, Special Effect.)* [**1126**:1.5]

3.3.62 Pyrotechnics. Controlled exothermic chemical reactions that are timed to create the effects of heat, gas, sound, dispersion of aerosols, emission of visible electromagnetic radiation, or a combination of these effects to provide the maximum effect from the least volume. [**1126**:1.5]

3.3.63 Railway. Any steam, electric, diesel-electric, or other railroad or railway that carries passengers for hire on the particular line or branch in the vicinity of a pyrotechnics manufacturing or storage facility.

3.3.64 Retail Sales. The retail display and sale of merchandise to the public within a mercantile occupancy.

3.3.65 Rocket. A pyrotechnic device that moves by the ejection of matter produced by the internal combustion of propellants.

3.3.66 Salute. A display firework that is designed to produce a loud report.

3.3.66.1 ***Bulk Salute.*** A collection of salutes or salute components containing more than 2 lb (0.9 kg) of salute powder, unless the salutes are mixed with other types of aerial shells so that the total quantity of salutes to other types of shells is less than 50 percent in a single magazine.

3.3.67 Salute Powder. See 3.3.52.3.

3.3.68 Screen Barricade. See 3.3.5.3.

3.3.69 Shipping Building. See 3.3.9.9.

3.3.70 Special Fireworks. See 3.3.30.4.

3.3.71* Stars. Small masses of pyrotechnic compounds that are projected from aerial shells, mines, or roman candles.

3.3.72 Storage Building. See 3.3.9.10.

3.3.73* Store. A building classified as a mercantile occupancy that contains a variety of merchandise and that is not used primarily for the retail sales of consumer fireworks.

3.3.74 Temporary. As applied to buildings or structures: a building or structure not meeting the definition for permanent structure [**101**:3.3]. As applied to electrical power and wiring: electrical service in use or in place for a period of 90 consecutive calendar days or less. [**70**:305]

3.3.75 Unoccupied Building. See 3.3.9.11.

3.3.76 Whistle Composition. See 3.3.15.3.

Chapter 4 Manufacturing Operations

4.1 Applicability.

4.1.1 All manufacturing facilities shall comply with the requirements of this chapter.

4.1.2 Manufacturing facilities shall not be required to comply with Sections 4.4, 4.7, 4.8, and 4.9, provided that they meet all of the following conditions:

(1) Manufacturing is restricted to production of custom fireworks, pyrotechnic articles, and any component(s) containing pyrotechnic or explosive materials that are not for general sale.
(2) The facility contains not more than 2.3 kg (5 lb) of pyrotechnic composition, of which not more than 0.23 kg (0.5 lb) is of explosive composition.
(3) All explosive and pyrotechnic compositions are removed to a storage magazine at the end of each workday.

4.1.3 This chapter shall not apply to the following operations performed in a separate building or area and shall not be considered fireworks manufacturing:

(1) Assembly of display pieces from finished fireworks, pyrotechnic articles, and fuse classified as UN 0336, UN 0337, UN 0431, and UN 0432
(2) Minor repairs or modification of finished fireworks not involving exposed pyrotechnic material
(3) Picking and packaging finished fireworks into packages including assortments
(4) Packing packages and assortments into DOT approved packaging.
(5) The attachment of a match or fuse and minor repairs to display fireworks and pyrotechnic articles

4.2 Permit Requirements. The manufacture of any fireworks shall be prohibited unless authorized by federal license, where required, and conducted in accordance with this code.

4.2.1 Persons engaged in the business of importing, manufacturing, or dealing in fireworks shall meet both of the following requirements:

(1) They shall possess a valid federal license or permit, where required by Title XI, "Regulation of Explosives, of the Crime Control Act of 1970" (18, USC, Chapter 40, "Importation, Manufacture, Distribution, and Storage of Explosive Materials")
(2) They shall comply with all applicable state and local laws and regulations.

4.2.1.1 Copies of all required licenses and permits shall be posted at each manufacturing facility.

4.2.1.1.1 License and permit holders shall protect licenses and permits from loss, theft, defacement, destruction, or unauthorized duplication.

4.2.1.1.2 Any loss, theft, defacement, destruction, or unauthorized duplication of a license or permit shall be reported immediately to the issuing authority.

4.2.1.2 Licenses or permits shall not be assigned or transferred.

4.2.2 The issuing authority shall be notified immediately of any change of business name, controlling ownership, or address.

4.3 Recordkeeping and Reporting.

4.3.1 Record Maintenance.

4.3.1.1 Manufacturers shall maintain records in compliance with federal regulations.

4.3.1.2 Manufacturers shall maintain records for all chemicals and chemical mixtures in compliance with the requirements of 29 CFR, 1910.1200, "Hazard Communication."

4.3.2 Record Availability. Records shall be made available to the authority having jurisdiction.

4.3.2.1 Where consumer fireworks are handled exclusively, records shall be maintained for 3 years.

4.3.2.2 Records other than consumer fireworks shall be maintained for 5 years.

4.3.3 Loss, Theft, or Unlawful Removal of Explosive Materials.

4.3.3.1 The loss, theft, or unlawful removal of explosive materials shall be reported immediately to the nearest office of the Bureau of Alcohol, Tobacco and Firearms, U.S. Department of the Treasury, and to local law enforcement authorities.

4.3.3.2 The loss, theft or removal of consumer fireworks shall not be required to be reported.

4.4 Site Security.

4.4.1 General. All plant buildings containing pyrotechnic composition, explosive composition, or fireworks shall be locked at the end of the workday and whenever plant personnel are not present, to provide security.

4.4.2 Plant Access.

4.4.2.1 All roads leading into the plant shall be provided with gates that shall be kept closed and locked at all times when not used for entry or exit.

4.4.2.2 Vehicle access to the plant shall be restricted to roadways by means of a fence, natural barriers such as trees, and culverts, or by other means.

4.4.2.3 If the main plant entrance is in full view of and under the observation of an authorized responsible employee or guard, the main plant entrance shall be permitted to be left open during regular plant operating hours.

4.4.2.4 Only authorized employees or representatives of federal, state, or local agencies having jurisdiction over the plant shall be permitted inside the plant without special permission of the person in charge.

4.4.3 Signage. Conspicuous signs that read as follows shall be posted at the entrance and along the fence or barrier:

WARNING — NO SMOKING — NO TRESPASSING

4.5 Construction.

4.5.1 Process Building.

4.5.1.1 Process buildings shall be single-story buildings and shall not have basements.

4.5.1.2 Wall joints and openings for wiring, plumbing, and other utilities shall be sealed to prevent the entry of dusts.

4.5.1.3 Horizontal ledges and surfaces upon which dust can settle and accumulate shall be minimized.

4.5.2* Floors and Work Surfaces.

4.5.2.1 Floors and work surfaces shall not have cracks or crevices in which explosives or pyrotechnic compositions can lodge.

4.5.2.2 Floors and work surfaces in mixing and loading buildings for salute powder shall be of conductive materials.

4.5.2.3 Conductive footwear or other grounding techniques for personnel shall be used wherever exposed salute powder is present.

4.5.3 Heating, Lighting, and Electrical Equipment.

4.5.3.1 Stoves, exposed flames, and portable electric heaters shall be prohibited in any building where fireworks, fireworks components, or flammable liquids are or can be present.

4.5.3.2 Heating shall be provided by steam, hot water, indirect hot air radiators, or any other means acceptable to the authority having jurisdiction.

4.5.3.3 Unit heaters located in buildings that contain exposed explosive or pyrotechnic composition shall be equipped with motors and electrical devices for use in hazardous locations in accordance with Article 502 of NFPA 70, *National Electrical Code®*.

4.5.3.4 All wiring, switches, and electrical fixtures in process buildings shall meet the requirements for hazardous locations in accordance with Article 502 of NFPA 70, *National Electrical Code®*.

4.5.3.4.1 Portable lighting equipment shall not be used, unless both of the following criteria are met:

(1) Listed portable lighting equipment shall be permitted to be used during repair operations.
(2) The repair operations area shall be cleared of all pyrotechnic or explosive material, and all dust or residue shall be removed before portable lighting equipment is used.

4.5.3.4.2 All presses and other such mechanical devices used in the vicinity of exposed explosive or pyrotechnic composition shall be electrically bonded and grounded.

4.5.3.5 All artificial lighting shall be electrically powered.

4.5.4 Static Discharge.

4.5.4.1 A means for discharging static shall be provided at the entrance to all mixing, pressing, and loading buildings where exposed salute powder is present.

4.5.4.2 All personnel entering the buildings described in 4.5.4.1 shall utilize the means required by 4.5.4.1.

4.5.5 Explosion Relief.

4.5.5.1* Provision of explosion relief, by means of pressure-relieving construction or explosion vents, shall be considered for each process building in which an explosion hazard exists.

4.5.5.2 Where climatic conditions (or local building code requirements) prevent the use of pressure-relieving construction or explosion vents, alternate methods of protecting nearby buildings such as, but not limited to, screen-type barricades and differences in elevation of trees shall be provided for buildings in which an explosion hazard exists.

4.5.6 Means of Egress.

4.5.6.1 Means of egress in all buildings shall comply with applicable requirements of NFPA *101®*, *Life Safety Code®*.

4.5.6.2 Means of egress in process buildings also shall comply with the following requirements:

(1) At least two remotely located means of egress shall be provided from every point in every undivided floor area of more than 9 m^2 (100 ft^2).
(2) Where process buildings are divided into rooms, means of egress shall be as follows:
   (a) At least two means of escape shall be provided from each room of more than 9 m^2 (100 ft^2).
   (b) Toilet rooms shall be permitted to have only one means of egress, provided that they are located away from or shielded from process areas.
(3) An unobstructed means of egress shall be located so that every point within the room or undivided floor area is within 7.6 m (25 ft) of a means of egress.
(4) Exit doors shall open outward and shall be capable of being pressure actuated from the inside.

4.6 Magazine Construction — General.

4.6.1 General.

4.6.1.1 Magazines shall be constructed to comply with Section 4.6 or in a manner equivalent to the requirements of Section 4.6.

4.6.1.2 The ground around magazines shall be graded so that water drains away from the magazine.

4.6.1.3 Exposed ferrous metal shall not be permitted on the interior of the magazine where it might contact material stored within.

4.6.2 Heating.

4.6.2.1 The area between the heating unit and the magazine shall be cleared of all combustible materials.

4.6.2.2 Magazines requiring heat shall be heated by either hot-water radiant heating within the magazine building or by indirect warm-air heating.

4.6.2.3 Indirect warm air shall be heated by either hot-water coils or low-pressure [103 kPa (15 psig) or less] steam coils located outside the magazine building.

4.6.2.4 Magazine heating systems shall meet the following requirements:

(1) Radiant heating coils within the building shall be installed so that explosive materials or their containers cannot contact the coils and so that air is free to circulate between the coils and the explosives.
(2) The surface temperature of radiant heating coils shall not exceed 74°C (165°F).
(3) Heating ducts shall be installed so that the hot air discharge from the ducts is not directed against explosive materials or their containers.
(4) The heating system shall be controlled so that the ambient temperature of the magazine does not exceed 54°C (130°F).

(5) Any electric fan or pump used in the heating system shall be located outside the magazine, separate from the magazine walls, and shall be grounded.
(6) Any electric motor and any controls for electric heating devices used to heat water or produce steam shall have overload devices and disconnects that comply with NFPA 70, *National Electrical Code®*.
(7) All electrical switchgear shall be located at least 7.6 m (25 ft) from the magazine.
(8) Any fuel-fired heating source for the hot water or steam shall be separated from the magazine by a distance of not less than 7.6 m (25 ft).
(9) Explosive materials stored in magazines shall be arranged so that uniform circulation of air is ensured.

4.6.3 Lighting.

4.6.3.1 Where lighting is necessary within the magazine, the following sources of lighting shall be permitted:

(1) Electric safety flashlights
(2) Electric safety lanterns
(3) Chemiluminescent lighting
(4) Electric light source outside the magazine that is aimed at the entrance

4.6.3.2 Where electric lighting is used within a magazine, the installation shall meet the following requirements for hazardous locations in accordance with NFPA 70, *National Electrical Code®*:

(1) Junction boxes containing fuses or circuit breakers and electrical disconnects shall be located at least 7.6 m (25 ft) from the magazine.
(2) Junction boxes located within the magazine shall not have openings and shall be equipped with close-fitting covers.
(3) Disconnects, fuses, and circuit breakers shall be protected by a voltage surge arrester capable of handling 2500 amperes for 0.1 seconds.
(4) All wiring from switches, both inside and outside the magazine, shall be installed in rigid conduit.
(5) Wiring from switches located inside and outside the magazine that leads into the magazine shall be installed underground.
(6) Conduit and light fixtures inside the magazine shall be protected from physical damage by guards or by location.
(7) Light fixtures shall be enclosed to prevent sparks or hot metal from falling on the floor or onto material stored in the magazine.
(8) Lights inside magazines shall not be left on when the magazines are unattended.

4.6.4 Ventilation.

4.6.4.1 Where required in the magazine, ventilation shall be provided to protect the stored materials for the specific area in which the plant is located.

4.6.4.2 Stored materials shall be placed so that they do not interfere with ventilation and to prevent contact with masonry walls, steel, or other ferrous metal by means of a nonsparking lattice or equivalent lining.

4.7 Magazine Construction — Requirements for Specific Types.

4.7.1 Type 1 Magazine. A Type 1 magazine shall be a permanent structure, such as a building or igloo, that is bullet resistant, fire resistant, theft resistant, weather resistant, and ventilated and shall comply with the following:

(1) Walls and doors shall be bullet resistant and shall be constructed in accordance with any of the specifications in Annex B.
(2) The roof shall be constructed of any type of structurally sound material that is or has been made fire resistant on the exterior.
(3)*Where the natural terrain around a Type 1 magazine makes it possible for a bullet to be shot through the roof and ceiling at such an angle that the bullet can strike the explosive materials within, either the roof or the ceiling shall be of bullet-resistant construction.
(4) The foundation shall be enclosed completely, and the following requirements also shall apply:
  (a) A wood foundation enclosure shall be covered on the exterior with not less than 26-gauge metal.
  (b) Openings provided for cross ventilation on the exterior of a wood foundation enclosure shall not be required to be covered with 26-gauge metal.
(5) The floor shall be constructed of wood or other equivalent material.
(6) Floors constructed of materials that can cause sparks shall meet one of the following requirements:
  (a) They shall be covered with a nonsparking surface.
  (b) The packages of explosive material shall be packed on pallets of nonsparking material.
(7) Type 1 magazines shall be ventilated to prevent dampness or heating of explosives, and the following requirements also shall apply:
  (a) Ventilation openings shall be screened to prevent entrance of sparks.
  (b) Ventilators in sidewalls shall be offset or shielded.
  (c) Magazines with foundation and roof ventilators, with air circulating between the sidewalls and floor and between the sidewalls and ceiling, shall have a wood-lattice lining or equivalent means to prevent packages from being stacked against the sidewalls and blocking air circulation.
  (d) Magazines specified in 4.7.1(7)(c) shall be provided with 50.8-mm (2-in.) air space between the sidewalls and the floor.
(8) Each door of the magazine shall be equipped with one of the following locking systems:
  (a) Two mortise locks
  (b) Two padlocks in separate hasps and staples
  (c) A mortise lock and a padlock
  (d) A mortise lock that needs two keys to be opened
  (e) A three-point lock or an equivalent lock that secures the door to the frame at more than one point
(9) Padlocks shall comply with all of the following requirements:
  (a) They shall be made of steel.
  (b) They shall have at least five tumblers.
  (c) They shall have at least a 9.5-mm (⅜ -in.), case-hardened shackle.
  (d) They shall be protected by steel hoods installed to discourage the insertion of bolt cutters.
(10) Doors secured by an internal bolt shall not require additional locking devices.
(11) Hinges and hasps shall be fastened securely to the magazine.
(12) All locking hardware shall be secured to the door frame.

4.7.2 Type 2 Magazine.

4.7.2.1 General. A Type 2 magazine shall be a portable or mobile structure, such as a box, skid-magazine, trailer, or semitrailer that is fire resistant, theft resistant, weather resistant, and ventilated.

4.7.2.2 Bullet Resistance. Type 2 magazines shall be bullet resistant if used for outdoor storage.

4.7.2.3 Type 2 Outdoor Magazine. A Type 2 outdoor magazine shall comply with the following requirements:

(1) The walls and roof or ceiling shall be constructed according to the provisions of 4.7.1(1), (2), and (3).
(2) The doors shall be constructed as follows:
   (a) They shall be made of metal, constructed in accordance with the provisions of 4.7.1(1).
   (b) They shall have a metal exterior with an inner door meeting the provisions of 4.7.1(1).
(3) Floors constructed of ferrous metal shall be covered with a nonsparking surface.
(4) A top-opening magazine shall have a lid that overlaps the sides by at least 25.4 mm (1 in.) when in the closed position.
(5) The magazine shall be supported so that its floor does not contact the ground directly.
(6) Magazines less than 0.77 m^3 (3 ft^3) in size shall be fastened securely to a fixed object to prevent theft of the entire magazine.
(7) Hinges, hasps, locks, and locking hardware shall comply with 4.7.1(8), excluding padlocks on vehicular magazines, which are not required to be protected by steel hoods.
(8) Wherever a vehicular magazine is left unattended, one of the following actions shall be taken:
   (a) The wheels shall be removed.
   (b) The kingpins shall be locked.
   (c) The vehicular magazine shall be otherwise immobilized.

4.7.2.4 Type 2 Indoor Magazines. A Type 2 indoor magazine shall comply with the following provisions:

(1) The magazine shall have substantial wheels or casters to facilitate removal from the building in case of emergency.
(2) The cover of the magazine shall have substantial strap hinges, and a means for locking shall be provided as follows:
   (a) The magazine shall be kept locked with a five-tumbler padlock or its equivalent.
   (b) The magazine shall be permitted to be unlocked during the placement or removal of explosive materials.
(3) The magazine shall be painted red, and the top shall bear the following words in white letters at least 76.2 mm (3 in.) high:
   EXPLOSIVES — KEEP FIRE AWAY
(4) Magazines constructed of wood shall meet the following requirements:
   (a) They shall have sides, bottoms, and covers or doors of 50.8-mm (2-in.) hardwood that are braced at the corners.
   (b) They shall be covered with sheet metal of not less than 26 gauge.
   (c) Nails exposed to the interior of the magazines shall be countersunk.
(5) Magazines constructed of metal shall meet the following requirements:
   (a) They shall be of 12-gauge sheet metal.
   (b) They shall be lined with a nonsparking material.
   (c) The edges of metal covers shall overlap the sides by at least 25.4 mm (1 in.).

4.7.3 Type 3 Magazine. A Type 3 magazine (day box) shall be a portable structure that is fire resistant, theft resistant, and weather resistant, and shall comply with the following provisions:

(1) The magazine shall be equipped with a five-tumbler padlock.
(2) Magazines constructed of wood shall meet the following requirements:
   (a) They shall have sides, bottoms, and covers or doors of 101.6-mm (4-in.) hardwood that are braced at the corners.
   (b) They shall be covered with sheet metal of not less than 26 gauge.
   (c) Nails exposed to the interior of the magazine shall be countersunk.
(3) Magazines constructed of metal shall meet the requirements of 4.7.2.4(5).

4.7.4 Type 4 Magazine. A Type 4 magazine shall be a permanent, portable, or mobile structure such as a building, igloo, box, semitrailer, or other mobile container that is fire resistant, theft resistant, and weather resistant.

4.7.4.1 Type 4 Outdoor Magazine. A Type 4 outdoor magazine shall comply with the following provisions:

(1) The magazine shall be constructed of the following:
   (a) Masonry
   (b) Wood covered with sheet metal, fabricated metal, or a combination of these materials
(2) Doors shall be metal or wood covered with metal.
(3) Permanent magazines shall comply with 4.7.1(4), (7), and (8).
(4) Vehicular magazines shall comply with 4.7.2.3(7) and shall be immobilized where unattended, as described in 4.7.2.3(8).

4.7.4.2 Type 4 Indoor Magazine. A Type 4 indoor magazine shall comply with all the provisions of 4.7.2.4.

4.8 Separation Distances and Quantity Tables.

4.8.1 General.

4.8.1.1 Barricades. To be effective, a barricade shall be of such height that one of the following passes through the barricade:

(1) A straight line measured from the top of any sidewall of a magazine or building containing explosives to the eave line of any magazine or building
(2) A straight line measured from the top of any sidewall of a magazine or building containing explosives to a point 3.7 m (12 ft) above the center of a railway or highway

4.8.1.2 Screen Barricades.

4.8.1.2.1 Screen barricades shall be permitted to be constructed of one of the following:

(1) Metal roofing
(2) 6 mm to 13 mm (0.25 in. to 0.5 in.) mesh screen
(3) Other equivalent material

4.8.1.2.2 The screen barrier shall extend from floor level to a height such that a straight line measured from the top of any sidewall of the donor building to the eave line of any exposed

building intercepts the screen at a point not less than 1.5 m (5 ft) from the top of the screen.

4.8.1.2.3 The top 1.5 m (5 ft) of the screen barrier shall incline toward the donor building at an angle of 30 degrees to 45 degrees.

4.8.2 Separation Distances and Quantity Tables for Process Buildings and Areas.

4.8.2.1 Process buildings and areas shall be separated from other process buildings and areas and from nonprocess buildings in accordance with the distances specified in Table 4.8.2.1.

4.8.2.2 A maximum of 227 kg (500 lb) of in-process composition, in loose form or in partially assembled display fireworks, shall be permitted in any process building or area.

4.8.2.3 Finished display fireworks shall not be stored in a process building. *(See Section 4.9.)*

4.8.2.4 A maximum of 4.5 kg (10 lb) of salute powder, in loose form or in assembled units, shall be permitted in any process building or area.

4.8.2.5 Quantities of loose salute powder in excess of 4.5 kg (10 lb) shall be kept in an approved magazine.

4.8.2.6 The minimum separation distance for in-process consumer fireworks or pyrotechnic articles shall be as follows:

(1) The minimum separation distance of 11 m (37 ft) for in-process consumer fireworks or pyrotechnic articles shall apply only to 45 kg (100 lb) of loose powder or stars.
(2) If a quantity of loose powder or stars greater than 45 kg (100 lb) is present, the minimum separation distances in Table 4.8.2.1 for in-process display fireworks shall be used.

4.8.3 Separation Distances for Process Buildings and Areas from Inhabited Buildings, Passenger Railways, Public Highways, Magazines, and Shipping and Storage Buildings. Process buildings and areas shall be separated from the following in accordance with the distances specified in Table 4.8.3:

(1) Inhabited buildings
(2) Passenger railways
(3) Public highways
(4) Magazines
(5) Display fireworks shipping buildings
(6) Consumer fireworks storage buildings

4.8.3.1* The distances in Table 4.8.3 shall apply to process buildings and areas with or without barricades or screen-type barricades.

4.8.3.2 Table 4.8.3 shall not apply to the separation distances between process buildings or areas (see Table 4.8.2.1), between magazines (see Table 4.8.4.1 and Table 4.8.4.5), and between storage buildings (see Table 4.8.6).

4.8.3.3 A maximum of 227 kg (500 lb) of in-process composition, in loose form or in partially assembled display fireworks, shall be permitted in any process building or area.

4.8.3.4 Finished display fireworks shall not be stored in a process building. *(See Section 4.9.)*

4.8.3.5 A maximum of 4.5 kg (10 lb) of salute powder, either in loose form or in assembled units, shall be permitted in any process building or area at one time.

4.8.3.6 Quantities of salute powder in excess of 4.5 kg (10 lb) shall be kept in an approved magazine.

4.8.4 Separation Distances and Quantity Tables for Magazines for the Storage of Display Fireworks and Components for Display Fireworks, Loose Pyrotechnic Composition, and Stars.

4.8.4.1 Magazines for the storage of display fireworks and components for display fireworks, loose pyrotechnic composition, and stars shall be separated from inhabited buildings, passenger railways, public highways, and other magazines in accordance with the distances specified in Table 4.8.4.1.

4.8.4.2 For the purposes of applying Table 4.8.4.1, a shipping building for display fireworks shall be considered a magazine.

Table 4.8.2.1 Minimum Separation Distances Between Process Buildings and Areas and Distances Between Process and Nonprocess Buildings and Areas

Net Weight of Fireworks[1]		In-Process Display without Barricades		In-Process Display with Barricades		In-Process Consumer Fireworks or Pyrotechnic Articles[2,3]	
kg	lb	m	ft	m	ft	m	ft
> 0 to ≤ 45	> 0 to ≤ 100	35	114	17	57	11	37
> 45 to ≤ 91	> 100 to ≤ 200	42	138	21	69	11	37
> 91 to ≤ 136	> 200 to ≤ 300	47	154	23	77	11	37
> 136 to ≤ 181	> 300 to ≤ 400	52	170	26	85	11	37
> 181 to ≤ 227	> 400 to ≤ 500	55	182	28	91	11	37
> 227 to ≤ 454	> 500 to ≤ 1000	NP		NP		11	37
> 454 to ≤ 907	> 1000 to ≤ 2000	NP		NP		11	37
> 907 to ≤ 1361	> 2000 to ≤ 3000	NP		NP		15	48
> 1361 to ≤ 1814	> 3000 to ≤ 4000	NP		NP		18	60
> 1814	> 4000	NP		NP		20	67

NP: Not permitted.
[1] Net weight equals the weight of all pyrotechnic and explosive composition and fuse only.
[2] For maximum quantity of pyrotechnic composition permitted in a pyrotechnics laboratory, see 4.8.9.3.
[3] See 4.8.2.6(1).

Table 4.8.3 Minimum Separation Distances of Process Buildings and Areas from Inhabited Buildings, Passenger Railways, Public Highways, Manufacturing Facility Magazines and Shipping Buildings, and Storage Buildings for Consumer Fireworks

Net Weight of Fireworks[1]		In-Process Display Fireworks[2]		In-Process Consumer Fireworks or Pyrotechnic Articles	
kg	lb	m	ft	m	ft
> 0 to ≤ 45	> 0 to ≤ 100	61	200	7.6	25
> 45 to ≤ 227	> 100 to ≤ 500	61	200	15	50
> 227 to ≤ 454	> 500 to ≤ 1000	NP		23	75
> 454 to ≤ 907	> 1000 to ≤ 2000	NP		30	100
> 907 to ≤ 1361	> 2000 to ≤ 3000	NP		35	115
> 1361 to ≤ 1814	> 3000 to ≤ 4000	NP		38	124
> 1814	> 4000	NP		40	130

NP: Not permitted.
[1] Net weight equals the weight of all pyrotechnic and explosive composition and fuse only.
[2] For information on the separation distances between process buildings see Table 4.8.2.1, between magazines see Table 4.8.4.1 and Table 4.8.4.5, and between storage buildings see Table 4.8.6.

Table 4.8.4.1 Minimum Separation Distances for the Storage of Display Fireworks Except Bulk Salutes, at Fireworks Manufacturing Plants from Passenger Railways, Public Highways, Fireworks Magazines and Shipping Buildings, Storage Buildings, and Inhabited Buildings

Net Weight of Fireworks*		In-Process Display Fireworks		In-Process Consumer Fireworks or Pyrotechnic Articles	
kg	lb	m	ft	m	ft
> 0 to ≤ 454	> 0 to ≤ 100	46	150	30	100
> 454 to ≤ 2,268	> 1,000 to ≤ 5,000	70	230	46	150
> 2,268 to ≤ 4,536	> 5,000 to ≤ 10,000	91	300	61	200
> 4,536	> 10,000	See Table 4.8.4.5.		?	?

*Net weight equals the weight of all pyrotechnic and explosive compositions and fuse only.

4.8.4.3 For the purposes of applying Table 4.8.4.1, the following criteria shall be met:

(1) Display fireworks shipping buildings shall meet the same distance requirements as magazines.
(2) All compositions not in current use shall be kept in covered, nonferrous containers, unless such composition has been loaded or pressed into tubes or other containers as consumer fireworks.

4.8.4.4 At a fireworks plant, up to 22.7 kg (50 lb) of pyrotechnic composition or display fireworks shall be permitted to be stored in a Type 2 or a Type 4 indoor magazine in any process building.

4.8.4.5 Magazines for the storage of bulk salute powder and bulk salutes shall comply with Table 4.8.4.5.

4.8.4.6 For fireworks storage magazines in active use prior to March 7, 1990, the distances in Table 4.8.4.1 shall be permitted to be halved, provided that earthen barricades are used between the magazine and potential receptor sites.

4.8.4.7 Table 4.8.4.1 shall not apply to the storage of bulk salute powder or to the storage of shipping cartons or storage containers that primarily contain salutes or salute components. *(See Table 4.8.4.5 for bulk salute powder and bulk salute storage requirements.)*

4.8.5 Magazines Containing Salute Powder and Salutes. Magazines containing salute powder and salutes shall be separated from each other and from inhabited buildings, public highways, and passenger railways in accordance with the distances specified in Table 4.8.4.5.

4.8.6 Separation Distances and Quantity Tables for Storage Buildings for Consumer Fireworks. Storage buildings for consumer fireworks located at fireworks manufacturing facilities shall be separated from inhabited buildings, passenger railways, public highways, and other storage buildings in accordance with the distances specified in Table 4.8.6.

4.8.7 Groups of Buildings.

4.8.7.1 If any process building is separated from any other process or nonprocess building by less than the distance specified in Table 4.8.2.1, two or more such buildings, as a group, shall be considered to be one building.

4.8.7.2 The total quantity of explosive and pyrotechnic composition in the group of buildings specified in 4.8.7.1 shall not exceed 227 kg (500 lb) or shall not exceed 4.5 kg (10 lb) of salute powder.

4.8.7.3 Each building in the group shall otherwise comply with the separation distances specified in Table 4.8.2.1 and Table 4.8.3.

Table 4.8.4.5 Table of Distances for Magazines for the Storage of Bulk Salute Powder and Bulk Salutes

Quantity of Explosive Materials[1,2,3,4]		Distances (ft)							
		Inhabited Buildings[9]		Public Highways Class A to D[11]		Passenger Railways — Public Highways with Traffic Volume of More than 3,000 Vehicles/Day[10,11]		Separation of Magazines[12]	
Pounds Over	Pounds Not Over	Barricaded[6,7,8]	Unbarricaded	Barricaded[6,7,8]	Unbarricaded	Barricaded[6,7,8]	Unbarricaded	Barricaded[6,7,8]	Unbarricaded
0	5	70	140	30	60	51	102	6	12
5	10	90	180	35	70	64	128	8	16
10	20	110	220	45	90	81	162	10	20
20	30	125	250	50	100	93	186	11	22
30	40	140	280	55	110	103	206	12	24
40	50	150	300	60	120	110	220	14	28
50	75	170	340	70	140	127	254	15	30
75	100	190	380	75	150	139	278	16	32
100	125	200	400	80	160	150	300	18	36
125	150	215	430	85	170	159	318	19	38
150	200	235	470	95	190	175	350	21	42
200	250	255	510	105	210	189	378	23	46
250	300	270	540	110	220	201	402	24	48
300	400	295	590	120	240	221	442	27	54
400	500	320	640	130	260	238	476	29	58
500	600	340	680	135	270	253	506	31	62
600	700	355	710	145	290	266	532	32	64
700	800	375	750	150	300	278	556	33	66
800	900	390	780	155	310	289	578	35	70
900	1,000	400	800	160	320	300	600	36	72
1,000	1,200	425	850	165	330	318	636	39	78
1,200	1,400	450	900	170	340	336	672	41	82
1,400	1,600	470	940	175	350	351	702	43	86
1,600	1,800	490	980	180	360	366	732	44	88
1,800	2,000	505	1,010	185	370	378	756	45	90
2,000	2,500	545	1,090	190	380	408	816	49	98
2,500	3,000	580	1,160	195	390	432	864	52	104
3,000	4,000	635	1,270	210	420	474	948	58	116
4,000	5,000	685	1,370	225	450	513	1,026	61	122
5,000	6,000	730	1,460	235	470	546	1,092	65	130
6,000	7,000	770	1,540	245	490	573	1,146	68	136
7,000	8,000	800	1,600	250	500	600	1,200	72	144
8,000	9,000	835	1,670	255	510	624	1,248	75	150
9,000	10,000	865	1,730	260	520	645	1,290	78	156
10,000	12,000	875	1,750	270	540	687	1,374	82	164
12,000	14,000	885	1,770	275	550	723	1,446	87	174
14,000	16,000	900	1,800	280	560	756	1,512	90	180
16,000	18,000	940	1,880	285	570	786	1,572	94	188
18,000	20,000	975	1,950	290	580	813	1,626	98	196
20,000	25,000	1,055	2,000	315	630	876	1,752	105	210
25,000	30,000	1,130	2,000	340	680	933	1,866	112	224
30,000	35,000	1,205	2,000	360	720	981	1,962	119	238
35,000	40,000	1,275	2,000	380	760	1,026	2,000	124	248
40,000	45,000	1,340	2,000	400	800	1,068	2,000	129	258
45,000	50,000	1,400	2,000	420	840	1,104	2,000	135	270
50,000	55,000	1,460	2,000	440	880	1,140	2,000	140	280
55,000	60,000	1,515	2,000	455	910	1,173	2,000	145	290
60,000	65,000	1,565	2,000	470	940	1,206	2,000	150	300
65,000	70,000	1,610	2,000	485	970	1,236	2,000	155	310
70,000	75,000	1,655	2,000	500	1,000	1,263	2,000	160	320
75,000	80,000	1,695	2,000	510	1,020	1,293	2,000	165	330
80,000	85,000	1,730	2,000	520	1,040	1,317	2,000	170	340
85,000	90,000	1,760	2,000	530	1,060	1,344	2,000	175	350
90,000	95,000	1,790	2,000	540	1,080	1,368	2,000	180	360

Table 4.8.4.5 *Continued*

Quantity of Explosive Materials[1,2,3,4]		Distances (ft)							
		Inhabited Buildings[9]		Public Highways Class A to D[11]		Passenger Railways — Public Highways with Traffic Volume of More than 3,000 Vehicles/Day[10,11]		Separation of Magazines[12]	
Pounds Over	Pounds Not Over	Barricaded[6,7,8]	Unbarricaded	Barricaded[6,7,8]	Unbarricaded	Barricaded[6,7,8]	Unbarricaded	Barricaded[6,7,8]	Unbarricaded
95,000	100,000	1,815	2,000	545	1,090	1,392	2,000	185	370
100,000	110,000	1,835	2,000	550	1,100	1,437	2,000	195	390
110,000	120,000	1,855	2,000	555	1,110	1,479	2,000	205	410
120,000	130,000	1,875	2,000	560	1,120	1,521	2,000	215	430
130,000	140,000	1,890	2,000	565	1,130	1,557	2,000	225	450
140,000	150,000	1,900	2,000	570	1,140	1,593	2,000	235	470
150,000	160,000	1,935	2,000	580	1,160	1,629	2,000	245	490
160,000	170,000	1,965	2,000	590	1,180	1,662	2,000	255	510
170,000	180,000	1,990	2,000	600	1,200	1,695	2,000	265	530
180,000	190,000	2,010	2,010	605	1,210	1,725	2,000	275	550
190,000	200,000	2,030	2,030	610	1,220	1,755	2,000	285	570
200,000	210,000	2,055	2,055	620	1,240	1,782	2,000	295	590
210,000	230,000	2,100	2,100	635	1,270	1,836	2,000	315	630
230,000	250,000	2,155	2,155	650	1,300	1,890	2,000	335	670
250,000	275,000	2,215	2,215	670	1,340	1,950	2,000	360	720
275,000	300,000	2,275	2,275	690	1,380	2,000	2,000	385	770

Explanatory Notes Essential to the Application of the American Table of Distances for Storage of Explosives

[1] "Explosive materials" means explosives, blasting agents, and detonators.

[2] "Explosives" means any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion. A list of explosives determined to be within the coverage of 18 USC, Chapter 40, "Importation, Manufacture, Distribution, and Storage of Explosive Materials," is issued at least annually by the Director of the Bureau of Alcohol, Tobacco, and Firearms of the Department of the Treasury. For quantity and distance purposes, detonating cord of 50 grains per foot should be calculated as equivalent to 8 lb (3.7 kg) of high explosives per 1,000 ft (305 m). Heavier or lighter core loads should be rated proportionately.

[3] "Blasting agents" means any material or mixture consisting of fuel and oxidizer, intended for blasting, not otherwise defined as an explosive, provided that the finished product, as mixed for use or shipment, cannot be detonated by means of a No. 8 test blasting cap where unconfined.

[4] "Detonator" means any device containing any initiating or primary explosive that is used for initiating detonation. A detonator shall not be permitted to contain more than 10 g of total explosives by weight, excluding ignition or delay charges. The term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses, detonating cord delay connectors, and nonelectric instantaneous and delay blasting caps that use detonating cord, shock tube, or any other replacement for electric leg wires. All types of detonators in strengths through No. 8 cap should be rated at 1 lb (0.7 kg) of explosives per 1,000 caps. For strengths higher than No. 8 cap, consult the manufacturer.

[5] "Magazine" means any building, structure, or container, other than an explosives manufacturing building, approved for the storage of explosive materials.

[6] "Natural barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures that require protection cannot be seen from the magazine when the trees are bare of leaves.

[7] "Artificial barricade" means an artificial mound or revetted wall of earth of a minimum thickness of 3 ft (0.9 m).

[8] "Barricaded" means the effective screening of a building containing explosive materials from the magazine or other building, railway, or highway by a natural or an artificial barrier. A straight line from the top of any sidewall of the building containing explosive materials to the eave line of any magazine or other building or to a point 12 ft (3.7 m) above the center of a railway or highway shall pass through such barrier.

[9] "Inhabited building" means a building regularly occupied in whole or part as a habitation for human beings, or any church, schoolhouse, railroad station, store, or other structure where people are accustomed to assemble, except any building or structure occupied in connection with the manufacture, transportation, storage, or use of explosive materials.

[10] "Railway" means any stream, electric, or other railroad or railway that carries passengers for hire.

[11] "Highway" means any public street, public alley, or public road.

[12] Where two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways, and highways, and, in addition, they should be separated from each other by not less than the distances shown for "separation of magazines," except that the quantity of explosive materials contained in detonator magazines shall govern with regard to the spacing of the detonator magazines from magazines containing other explosive materials. If any two or more magazines are separated from each other by less than the specified "separation of magazines" distances, then those two or more magazines, as a group, must be considered as one magazine, and the total quantity of explosive materials stored in such group must be treated as if stored in a single magazine located on the site of any magazine of the group, and must comply with the minimum distances specified from other magazines, inhabited buildings, railways, and highways.

[13] Storage in excess of 300,000 lb (136,200 kg) of explosive materials in one magazine is generally not required for commercial enterprises.

[14] This table applies only to the manufacture and permanent storage of commercial explosive materials. It is not applicable to transportation of explosives or any handling or temporary storage necessary or incident thereto. It is not intended to apply to bombs, projectiles, or other heavily encased explosives.

[15] Where a manufacturing building on an explosive materials plant site is designed to contain explosive materials, such building shall be located from inhabited buildings, public highways, and passenger railways in accordance with the American Table of Distances based on the maximum quantity of explosive materials permitted to be in the building at one time.

Source: The American Table of Distances is reproduced from the American Table of Distances for Storage of Explosives as revised and approved by the Institute of Makers of Explosives in June 1991.

Table 4.8.6 Minimum Separation Distances of Consumer Fireworks Storage Buildings at Fireworks Manufacturing Plants from Inhabited Buildings, Magazines, Passenger Railways, Public Highways, and Other Storage Buildings

Gross Weight of Consumer Fireworks		Distance from Passenger Railways, Public Highways, and Other Storage Buildings		Distance from Inhabited Buildings and Magazines	
kg	lb	m	ft	m	ft
0 to 454	0 to 1,000	11	35	21	70
454 to 2,268	1,000 to 5,000	17	55	34	110
2,268 to 4,536	5,000 to 10,000	18	60	37	120
4,536 to 9,072	10,000 to 20,000	20	65	41	135
9,072 to 22,680	20,000 to 50,000	24	80	49	160
22,680 to 45,360	50,000 to 100,000	27	90	55	180
45,360	100,000 and over	30	100	61	200

4.8.7.4 Unoccupied buildings at manufacturing facilities shall not be subject to the separation distance requirements of Section 4.8.

4.8.8 Magazine Groups.

4.8.8.1 If any two or more magazines or storage buildings are separated by less than the distances specified in Table 4.8.4.1, Table 4.8.4.5, or Table 4.8.6, two or more such structures shall be considered to be one magazine or storage building.

4.8.8.2 The total quantity of explosive and pyrotechnic composition stored in the group of buildings shall be used to determine the minimum separation distances of each building in the group from inhabited buildings, passenger railways, public highways, and other magazines and storage buildings.

4.8.8.3 No minimum separation distance shall be required for process buildings, magazines, or storage buildings within a group.

4.8.9 Pyrotechnic Laboratories.

4.8.9.1 Pyrotechnics laboratories shall be considered process buildings for consumer fireworks for the purpose of separation distances.

4.8.9.2 Pyrotechnics laboratories shall be considered to be nonprocess buildings with respect to the other requirements of this code.

4.8.9.3 Pyrotechnics laboratories shall not contain more than 4.5 kg (10 lb) of pyrotechnic composition and not more than 0.23 kg (0.5 lb) of salute powder, provided that all fireworks and pyrotechnic composition are stored properly when not in use.

4.9* Maximum Number of Occupants and Maximum Quantity Limitations. Not more than 227 kg (500 lb) of pyrotechnic or explosive composition shall be permitted at one time in any process building or area.

4.10 Operations.

4.10.1 The requirements of 27 CFR, 55, Bureau of Alcohol, Tobacco and Firearms, for transfer of the following from process buildings to magazines at the conclusion of daily operation shall be met:

(1) Dry explosive powders and mixtures
(2) Partially assembled display fireworks
(3) Finished display fireworks

4.10.2* Unless a variance from the requirement of 4.10.1 has been issued in writing to a manufacturer by the Bureau of Alcohol, Tobacco and Firearms, all dry explosive powders and mixtures, partially assembled display fireworks, and finished display fireworks shall be transferred from process buildings to magazines at the conclusion of daily operation.

4.11 Fire and Explosion Prevention.

4.11.1 Rubbish, Spills, and Waste Disposal.

4.11.1.1 All buildings shall be kept clean and orderly, and dust or rubbish shall be kept to a minimum.

4.11.1.2 Spills of explosive or pyrotechnic composition shall be cleaned up, and materials used for cleanup shall be removed immediately from the building.

4.11.1.3 The spilled material shall be destroyed by immersion in water or by burning in a manner acceptable to the authority having jurisdiction.

4.11.1.4 Rags, combustible scrap, and paper shall be kept separate from waste explosive or pyrotechnic materials.

4.11.1.5 Rags, combustible scrap, and paper shall be kept in approved, marked containers until removed from the building.

4.11.1.6 Disposal containers shall be removed from buildings on a daily basis and removed from the plant at regular intervals.

4.11.1.7 Waste explosive or pyrotechnic materials shall be destroyed as described in 4.11.1.3.

4.11.2 Smoking Materials.

4.11.2.1 Smoking materials shall not be carried into or in the vicinity of process buildings.

4.11.2.2 Personnel shall deposit all smoking materials at a designated location in a nonprocess building before entering a processing plant.

4.11.2.3* Smoking shall be permitted only in office buildings or in buildings used exclusively as lunchrooms or rest rooms and in which the presence of explosive or pyrotechnic materials is prohibited.

4.11.2.4 Authorized smoking locations shall comply with the following:

(1) They shall be marked as smoking areas.
(2) They shall contain designated receptacles for disposal of smoking materials.
(3) They shall be provided with at least one approved portable fire extinguisher for use on Class A fires.

4.11.2.5 Personnel whose clothing is contaminated with explosive or pyrotechnic composition to a degree that endangers personnel safety shall not be permitted in smoking areas.

4.11.3 Substance Abuse. No employee or other person shall be permitted to enter the plant while in possession of or under the influence of alcohol, drugs, or narcotics.

4.11.4 Clothing.

4.11.4.1 Personnel working at or supervising mixing, pressing, and loading operations shall be provided with and shall wear cotton or other similarly protective clothing.

4.11.4.2 Other protective clothing, eye protection, and respiratory protection shall be worn as needed.

4.11.4.3 Washing and changing facilities shall be provided for personnel.

4.11.4.4 Work clothing shall be washed frequently to prevent the accumulation of explosive or pyrotechnic composition and shall not be worn outside the plant.

4.11.5* Oxidizers.

4.11.5.1 Oxidizers shall be stored to avoid contact with incompatible materials such as ordinary combustibles, flammable or combustible liquids, greases, and materials that could react with the oxidizer or promote or initiate its decomposition.

4.11.5.2 Incompatible materials shall not include approved packaging materials, pallets, or other dunnage.

4.11.5.3 Oxidizer storage shall comply with NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers.*

4.11.6* Machinery and Tooling. Machinery and tooling shall be permitted to be made of ferrous metal. *(See also 4.5.3.4.2.)*

4.12 Fire Protection and Emergency Plans.

4.12.1 Fire Extinguishers.

4.12.1.1 Portable fire extinguishers shall be provided in all buildings in accordance with the requirements of NFPA 10, *Standard for Portable Fire Extinguishers.*

4.12.1.2 Fire extinguishers shall not be located in buildings in which explosive or pyrotechnic mixtures are exposed.

4.12.2 Emergency Plan.

4.12.2.1 Each plant shall have a formal emergency plan.

4.12.2.2 An emergency warning signal shall be established.

4.12.2.3 The emergency plan shall include employee instruction and training and shall be applicable to all anticipated emergencies.

4.12.2.4 The emergency plan shall include instruction in the use of portable fire extinguishers and the identification of fires on which they can be used.

4.12.2.5 Employees shall be instructed to abandon firefighting efforts if the fire involves or appears likely to spread to explosive or pyrotechnic composition or devices, in which case employees shall evacuate the building immediately and alert other plant personnel.

4.12.3 Master Electrical Disconnect.

4.12.3.1 A master electrical disconnect shall be provided at the point where the electrical service enters the plant.

4.12.3.2 The master disconnect shall be arranged to disconnect all electrical power to the plant.

4.12.3.3 Emergency circuits, such as the electrical supply to fire pumps or emergency lighting, shall have their own master disconnects.

4.13* Testing of Fireworks and Pyrotechnic Articles.

4.13.1 Testing of fireworks, pyrotechnic materials, and pyrotechnic and explosive compositions shall be performed only in a building or area specifically designated for the purpose.

4.13.2 Testing shall be conducted at a safe distance from other plant buildings or structures and process areas.

4.13.3 Testing of fireworks, pyrotechnic articles, and any component(s) containing pyrotechnic or explosive materials shall be performed only in an area specifically designated by the manufacturer and approved by the authority having jurisdiction.

4.14 Occupancies.

4.14.1* The number of occupants in each process building and in each magazine shall not exceed the number necessary to conduct production operations.

4.14.2 The maximum number of occupants and maximum weight of pyrotechnic and explosive composition permitted in each process building and in each magazine shall be posted in a conspicuous location in each process building or magazine.

4.15 Training.

4.15.1 Each plant shall designate an employee as safety officer who shall be responsible for general safety, fire prevention and protection, and employee safety training.

4.15.2 The safety officer shall provide formal instruction to all employees upon their commencing employment and at least annually thereafter, regarding safety methods, procedures, and requirements and procedures for handling explosive and pyrotechnic compositions and devices.

4.16 Item Construction.

4.16.1 Aerial Shells. Aerial shells shall be constructed so that they fit easily into the appropriately sized mortar, and so that the appropriate lift charge and internal delay fuse are used to propel the shell to a safe altitude before functioning.

4.16.2 Safety Caps. Safety caps shall comply with the following requirements:

(1) A safety cap shall be installed over the exposed end of the internal delay fuse.
(2) The safety cap shall be of a different color than that of the fuse and shall be installed in such a manner that the fuse remains undamaged when removed.
(3) Electrically fired displays shall not require a safety cap, provided that no pyrotechnic composition is exposed.

4.16.3 Display Fireworks–Ground Salutes.

4.16.3.1 Display fireworks–ground salutes shall not exceed 76 mm (3 in.) in diameter × 76 mm (3 in.) in length.

4.16.3.2 The maximum quantity of salute powder in display fireworks–ground salutes shall not exceed 71 g (2.5 oz).

4.16.3.3 Display fireworks–ground salutes shall not be constructed using brittle plastic.

4.16.3.4 To allow the person igniting the aerial shells to retreat safely, the time delay between igniting the tip of the shell's fuse and the firing of the shell shall be not less than 3 seconds or more than 6 seconds.

4.16.3.5 Electrically ignited displays shall not require the delay period specified in 4.16.3.4.

4.16.4 Labeling.

4.16.4.1 Pyrotechnic articles intended for indoor use shall be so marked, and labels shall include the following information:

(1) Accurate performance characteristics of the device
(2) For fountains, gerbs, and other preloads, duration, height, and diameter of the effect, as applicable

4.16.4.2 Pyrotechnic articles marked for indoor use shall be permitted to be used outdoors.

4.16.4.3 Pyrotechnic articles marked by the manufacturer for indoor use shall be used indoors only.

4.16.4.4 All binary systems shall be labeled with the following information in addition to the general requirements:

(1) Type of contents and general use of the material
(2) Description of conditions of use, potential hazards, and required equipment with instructions for use
(3) Manufacturer's statement regarding whether the material is permitted for indoor use and the conditions under which the material is to be used

4.16.4.5 All binary materials intended for indoor use shall be preweighed, premeasured, prepackaged, and identified by the manufacturer as permitted for indoor use.

4.16.5 Requirements for Display Fireworks Aerial Devices. In addition to the general requirements, the requirements of 4.16.5.1 through 4.16.5.6 shall apply to aerial devices for display fireworks.

4.16.5.1 Aerial shells, mines, and comets shall be classified and described only in terms of the inside diameter of the mortar from which they are to be fired.

4.16.5.2 As a minimum, each shell shall be marked with the following information:

(1) Size of the shell
(2) Description of the type of shell
(3)*Warning statement that reads as follows:
WARNING: DANGEROUS EXPLOSIVE. IF FOUND, DO NOT HANDLE. CONTACT LOCAL FIRE OR POLICE DEPARTMENT.
(4) User instructions for disposal, if needed

4.16.5.3 Single break aerial salute shells shall be limited to a maximum size of 5 in. in diameter and length (exclusive of propellant charge). Minimum standards of use shall include:

(1) Non-metal mortars shall be used.
(2) Mortars used for salutes over 3 in. in diameter and length (exclusive of propellant charge) shall be individually supported and separated from other mortars by 10 times the inside diameter of the mortar.
(3) Remote ignition or use of an added 5-second minimum delay fuse extension shall be used.
(4) Salute shells shall be preloaded into mortars.

4.16.5.4 Multiple break shells with salutes and shells consisting of multiple salute inserts or components shall meet the following requirements:

(1) Final or "bottom" shots (salutes) on multiple break shells shall not exceed the criteria for single break salutes.
(2) Aerial shells containing multiple salutes shall consist of component salutes not exceeding 3 in. and 3 oz individually.
(3) Requirements of ruse and operator restrictions described for single break salutes shall apply, except that multibreak shells shall be permitted to be fired from steel mortars buried in the ground, troughs, or drums.

4.16.5.5 The label or wrapper of any type of aerial salute shall be marked with the word *salute*.

4.16.5.6 All preloaded, chain-fused aerial items shall have instructions for placement and stabilization necessary to prevent tipover.

Chapter 5 Storage of Display Fireworks, Pyrotechnic Articles, Salute Powder, Pyrotechnic and Explosive Compositions, and Black Powder

5.1 General Requirements.

5.1.1 Display fireworks, pyrotechnic articles, salute powder, pyrotechnic and explosive compositions, and black powder shall be stored in magazines at all times, except during manufacture, packaging, transportation, or use.

5.1.1.1 Bulk salute and bulk salute powder shall be stored only in Type 1 or Type 2 magazines.

5.1.1.2 The following shall be stored only in Type 1, Type 2, or Type 4 magazines:

(1) Display fireworks that are not bullet sensitive
(2) Pyrotechnic articles categorized as Explosives 1.3, other than bulk salute and bulk salute powder
(3) Black powder

5.1.2 Magazines containing display fireworks and pyrotechnic articles that are not categorized as Explosives 1.4 shall be separated from inhabited buildings, passenger railways, and public highways by the distances specified in Table 4.8.3 or Table 4.8.4.5.

5.1.3 Magazines containing display fireworks and pyrotechnic articles that are not categorized as Explosives 1.4 shall be separated from other magazines and from plant buildings by the distances specified in Table 4.8.2.1.

5.1.4 Magazines containing black powder shall be separated from inhabited buildings, passenger railways, public highways, and other magazines by the distances specified in Table 4.8.3.

5.2 Storage Within Magazines.

5.2.1 Magazines shall be supervised at all times by a competent person at least 21 years old who shall be responsible for enforcing all safety precautions.

5.2.2* All magazines containing explosives shall be inspected at intervals not exceeding 7 days to determine whether there has been unauthorized or attempted entry or whether there has been unauthorized removal of the magazines.

5.2.3* Magazine doors shall be kept closed and shall be kept locked at all times when the facility is not in operation.

5.2.4 Magazine doors shall not be required to be closed and locked during placement or removal of explosive materials or during inspection.

5.2.5* Containers of explosive materials shall be piled in a stable manner and laid flat with top side up.

5.2.6 The following shall apply to containers of explosive materials:

(1) Containers shall not be opened, unpacked, or repacked inside of or within 15.2 m (50 ft) of a magazine or in close proximity to other explosives.
(2) Fiberboard containers shall be permitted to be opened inside of or within 15.2 m (50 ft) of a magazine, provided that they are not unpacked.

5.2.7 Tools used for opening containers of explosive materials shall be nonsparking, unless they are metal slitters used for opening fiberboard containers.

5.2.8 Magazines shall be used exclusively for the storage of explosive and pyrotechnic materials.

5.2.8.1 Metal tools other than nonferrous conveyors shall not be stored in magazines.

5.2.8.2 Ferrous metal conveyor stands protected by a coat of paint shall be permitted to be stored within magazines.

5.2.9 Magazine floors shall be swept regularly and kept clean, dry, and free of grit, paper, empty packing materials, and rubbish.

5.2.9.1 Brooms and other cleaning utensils shall not have spark-producing metal parts.

5.2.9.2 Sweepings from magazine floors shall be disposed of in accordance with the manufacturer's instructions.

5.2.10 Where any explosive or pyrotechnic material has deteriorated to the extent that it has become unstable or dangerous, the person responsible shall immediately contact the manufacturer for assistance.

5.2.11 Before repairs are made to the interior of a magazine, all explosive or pyrotechnic material shall be removed, and the interior shall be cleaned.

5.2.12 Before repairs are made to the exterior of a magazine where there is a possibility of causing sparks or fire, all explosive and pyrotechnic material shall be removed.

5.2.13 Explosive or pyrotechnic material removed from a magazine undergoing repair shall be stored as follows:

(1) The material shall be either placed in another magazine or placed a safe distance from the magazine, where it shall be guarded and protected properly.
(2) Upon completion of the repairs, the material shall be returned promptly to the magazine.

5.3 Miscellaneous Safety Precautions.

5.3.1 The following shall not be permitted inside of or within 15 m (50 ft) of a magazine:

(1) Smoking
(2) Matches
(3) Open flames
(4) Spark-producing devices
(5) Firearms, other than firearms carried by authorized security personnel

5.3.2 The area around a magazine shall be kept clear of brush, dried vegetation, leaves, and similar combustibles for a distance of at least 7.6 m (25 ft).

5.3.3 Combustible materials shall not be stored within 15.2 m (50 ft) of a magazine.

5.4 Requirements for Shipping Buildings for Display Fireworks.

5.4.1 Shipping buildings shall be separated from process buildings in accordance with the distances specified in Table 4.8.3.

5.4.2 Shipping buildings shall be separated from inhabited buildings, passenger railroads, public highways, and magazines in accordance with the distances specified in Table 4.8.4.1.

5.4.3* Separation distances for shipping buildings for storage of display fireworks shall be in accordance with Table 4.8.4.1 or Table 4.8.4.5, as appropriate, with a maximum of 22,680 kg (50,000 lb) net weight of display fireworks permitted to be stored.

5.4.4 Separation distances for shipping buildings for the storage of finished salutes shall be in accordance with Table 4.8.4.5 with a maximum of 227 kg (500 lb) net weight of finished salutes permitted to be stored.

5.4.5 All electrical equipment and fixtures in a shipping building shall meet the requirements for hazardous locations in accordance with NFPA 70, *National Electrical Code®*.

5.4.6 Display fireworks awaiting packing and shipping shall be permitted to be stored in a shipping building overnight, provided that the building is fire resistant and theft resistant.

5.4.6.1 The building shall be locked when not in operation.

5.4.6.2 Windows shall be guarded with bars or similar protection.

Chapter 6 Storage of Consumer Fireworks

6.1 Applicability.

6.1.1* Storage of consumer fireworks at manufacturing and distribution facilities shall comply with the requirements of this chapter.

6.1.2 The requirements of this chapter shall apply to the following:

(1) Permanent buildings and structures including the following:
   (a) Consumer fireworks storage buildings or areas
   (b) Consumer fireworks work buildings, rooms or areas
(2) Temporary facilities including the following:
   (a) Trailers
   (b) Semitrailers
   (c) Metal shipping containers

6.1.3 This chapter shall not apply to buildings or facilities where the net weight of the pyrotechnic content of consumer fireworks stored does not exceed 125 lb, or 250 lb where the building is protected throughout with an approved automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

6.1.4 Consumer fireworks storage buildings shall not be used as a magazine. Consumer fireworks shall be permitted to be stored in a magazine.

6.1.5 Consumer fireworks work buildings shall not be used as process buildings. Consumer fireworks shall be permitted to be processed in a process building.

6.1.6* For the purposes of this chapter, the terms "consumer fireworks" and "pyrotechnic articles" shall mean assembled devices that have been approved by the Department of Transportation as Fireworks UN0336 and Articles, Pyrotechnic UN0431 and UN0432.

6.2 General Requirements For the Storage of Consumer Fireworks.

6.2.1 Consumer fireworks storage buildings shall comply with the requirements of this chapter.

6.2.2 Work rooms or areas shall be permitted in consumer fireworks storage buildings provided such work rooms or areas comply with Section 6.13.

6.2.3 Exterior door and window openings in consumer fireworks storage buildings shall be equipped with a means for locking.

6.2.4 Consumer fireworks storage buildings shall not be used for residential occupancies and shall not be located in residential areas.

6.2.5 Finished consumer fireworks at a manufacturing or distribution facility shall be stored in consumer fireworks storage buildings, trailers, semitrailers, metal shipping containers, or magazines.

6.2.6 Receiving, picking, packing, packaging, and shipping shall be permitted in consumer fireworks storage buildings or areas.

6.3 Permit Requirements.

6.3.1 Permits. Where required, a permit shall be obtained to construct, erect, or operate any consumer fireworks storage or work building, room, or area.

6.3.2 Plans. Where required, plans for consumer fireworks storage or work buildings, rooms or areas shall be submitted to the authority having jurisdiction with the permit application. The plans shall include the design, details, and specifications for the following:

(1) Distances from public ways, buildings, facilities, magazines, motor vehicle fuel-dispensing stations, retail propane dispensing stations, flammable and combustible liquid aboveground tank storage, and flammable gas and flammable liquefied gas bulk aboveground storage and dispensing areas within 30.5 m (100 ft) of the building used to store or handle consumer fireworks
(2) Vehicle access and parking areas
(3) Location and type of portable fire extinguishers
(4) Floor plan and layout of storage and handling to indicate compliance with this chapter
(5) Means of egress
(6) Construction details

6.4 Construction.

6.4.1 Buildings and Structures. Consumer fireworks shall only be stored in the following buildings or structures, provided that the building or structure does not exceed one story in height and does not contain a basement:

(1) Buildings or structures constructed in accordance with the building code enforced by the authority having jurisdiction
(2) Buildings or structures constructed in accordance with 6.4.2
(3) Magazines meeting the requirements in Chapter 4.
(4) Trailers, semitrailers, and metal shipping containers that are separated by at least 6.1 m (20 ft) from any building or structure other than trailers, semitrailers, or metal shipping containers.

6.4.2 Construction Materials. The following construction requirements shall apply to consumer fireworks storage buildings in jurisdictions that have not adopted a building code:

(1) Buildings having an area not greater than 743 m^2 (8000 ft^2) shall be permitted to be constructed of any approved construction materials.
(2) Buildings having an area greater than 743 m^2 (8000 ft^2) shall be constructed in accordance with one of the following:
   (a) Buildings shall be constructed of noncombustible or limited combustible materials.
   (b) Buildings with exterior walls having a fire resistance rating of not less than 2 hours shall be permitted to have the roof decking and its supporting structure and interior partitions constructed of combustible materials.
(3) Roof coverings for any building shall have a minimum rating of Class C as determined in accordance with NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*.

6.4.3 Multiple Use Buildings.

6.4.3.1 Where consumer fireworks storage is located in a building containing other tenants, the consumer fireworks storage area shall be separated from the other tenants by fire barriers having a fire resistance rating of not less than 2 hours.

6.4.3.1.1 Openings in the fire barriers shall not be permitted.

6.4.3.1.2 Any penetrations of the fire barriers shall be protected in accordance with NFPA *101®*, *Life Safety Code®*.

6.4.3.2 Office areas ancillary to the consumer fireworks storage building shall be separated from the consumer fireworks storage area by fire barriers having a fire resistance rating of not less than 1 hour.

6.4.3.2.1 Door and window openings in the fire barrier wall shall be protected by self-closing fire doors or fixed fire windows having a fire protection rating of not less than ¾ hour and shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*.

6.4.3.2.2 Any other openings or penetrations in the fire barrier wall shall be protected in accordance with NFPA *101®*, *Life Safety Code®*.

6.4.4 Interior Wall and Ceiling Finish. Interior wall and ceiling finish shall be Class A, Class B, or Class C in accordance with NFPA *101®*, *Life Safety Code®*.

6.5 Fire Protection.

6.5.1* Automatic Sprinkler System. An automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, shall be provided in consumer fireworks storage buildings greater than 1,115 m^2 (12,000 ft^2).

6.5.1.1 The automatic sprinkler system shall be designed using the following criteria for the areas where the consumer fireworks are stored in DOT approved packaging:

(1) Consumer fireworks stored in DOT approved packaging shall be considered as a Class IV commodity.
(2) Consumer fireworks stored to a height not greater than 3 m (10 ft) in racks, or 3.7 m (12 ft) otherwise, shall be classified as an Ordinary Hazard (Group 2) occupancy.
(3) Consumer fireworks stored to a height not greater than 3.7 m (12 ft) in racks, but greater than 3 m (10 ft), shall be classified as an Extra Hazard (Group 1) occupancy.
(4) Consumer fireworks stored to a height greater than 3.7 m (12 ft) shall be protected by an automatic sprinkler system designed using a fire control approach or a special design approach in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

6.5.1.2 The waterflow alarm device shall be arranged to activate audible and visible alarms throughout the facility in accordance with *NFPA 72®*, *National Fire Alarm Code®*.

6.5.2 Portable Fire Extinguishers.

6.5.2.1 Installation. Portable fire extinguishers shall be installed in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

6.5.2.2 Minimum Number. Every consumer fireworks storage or work building shall have not less than two portable fire extinguishers with a minimum 2A rating.

6.5.2.3 Pressurized Water Type. At least one of the required fire extinguishers shall be of the pressurized water type.

6.5.2.4 Multipurpose Dry Chemical Type. At least one of the required fire extinguishers shall be of the multipurpose dry chemical type having a minimum 4A rating.

6.5.2.5 Location. Portable fire extinguishers for consumer fireworks storage or work buildings shall be located so that the maximum distance of travel to reach an extinguisher from any point shall not exceed 22.8 m (75 ft) as specified in NFPA 10, *Standard for Portable Fire Extinguishers*.

6.5.3 Smoke and Heat Vents. Smoke and heat vents designed and installed in accordance with NFPA 204, *Standard for Smoke and Heat Venting*, shall be provided in consumer fireworks storage buildings exceeding 4,644 m^2 (50,000 ft^2) in undivided area.

6.6 Site Requirements.

6.6.1* Fire Department Access. Any portion of an exterior wall of a building or other defined perimeter of a consumer fireworks storage facility shall be accessible within 45.7 m (150 ft) of a public way or an approved fire apparatus access.

6.7 Separation Distances.

6.7.1* Permanent consumer fireworks storage or work buildings shall be separated from adjacent permanent buildings and structures in accordance with Table 6.7.1.

6.7.1.1 The minimum separation distance shall not be less than 9.15 m (30 ft).

Table 6.7.1 Separation Distance for Permanent Consumer Fireworks Storage or Work Buildings

Exterior Wall Opening	Exterior Wall Fire Separation Distance	Resistance Rating (hr)	Protection Rating (hr)
m	ft		
9.15 < 18.3	30 < 60	1	¾
18.3	60	0	0

6.7.2 Other Separation Distances.

6.7.2.1 Consumer fireworks storage or work buildings shall not be located within 15.2 m (50 ft) of the following:

(1) Motor vehicle fuel-dispensing station dispensers
(2) Retail propane-dispensing station dispensers
(3) Compressed natural gas dispensing facilities
(4) Aboveground storage tanks for flammable or combustible liquid, flammable gas, or flammable liquefied gas

6.7.2.2 Consumer fireworks storage or work buildings shall not be located within 91.2 m (300 ft) of any aboveground bulk storage or bulk dispensing area for the following:

(1) Flammable or combustible liquid
(2) Flammable gas
(3) Flammable liquefied gas

6.7.2.3 Consumer fireworks storage or work buildings shall be separated from magazines and process buildings by the distances specified in Table 4.8.3.

6.8 Means of Egress.

6.8.1 Means of egress in permanent consumer fireworks storage or work buildings or areas shall comply with the applicable requirements of NFPA *101®*, *Life Safety Code®*.

6.8.2 Trailers, semitrailers, and metal shipping containers that are not normally occupied shall not be required to comply with NFPA *101®*, *Life Safety Code®*.

6.8.3 Doors.

6.8.3.1 Exterior exit doors shall open outward.

6.8.3.2 Doors in the means of egress shall be at least 910 mm (36 in.) wide and kept free of obstructions.

6.8.3.3 Exit doors shall be equipped with panic hardware.

6.8.3.4 Exit doors shall be unlocked when the building is occupied.

6.8.4 Aisles.

6.8.4.1 Aisles shall be at least 910 mm (36 in.) wide and shall be kept free of obstructions.

6.8.4.2 Dead end aisles shall not exceed 15.2 m (50 ft) in length.

6.8.5 Egress Travel Distance. Exits provided for consumer fireworks storage or work buildings or areas shall be located so that the maximum egress travel distance as measured from the most remote point to an exit along the natural and unobstructed path of egress travel shall not exceed 60.8 m (200 ft).

6.9 Exit Signs and Emergency Lighting.

6.9.1 Exit Signs.

6.9.1.1 Exits in consumer fireworks storage or work buildings or areas shall be marked by an approved exit sign in accordance with NFPA *101®*, *Life Safety Code®*.

6.9.1.2 Exit signs shall be required to be self-luminous or internally or externally illuminated.

6.9.2 Emergency Lighting.

6.9.2.1 The means of egress, including the exit discharge, shall be illuminated whenever the facility is occupied in accordance with NFPA *101®*, *Life Safety Code®*.

6.9.2.2 Emergency lighting shall be provided for consumer fireworks storage or work buildings or areas and shall comply with NFPA *101®*, *Life Safety Code®*.

6.10* Electrical Requirements. Electrical fixtures and wiring shall comply with NFPA 70, *National Electrical Code®*.

6.11 Operations.

6.11.1 Receiving, storing, picking from cartons, packing into cartons, packaging into retail packages including assortments, shipping, and other similar operations involving finished consumer fireworks shall be permitted in consumer fireworks storage or work buildings, rooms, or areas that meet the requirements of this chapter.

6.11.2 Picking, sorting, packaging, packing, and other similar operations involving finished consumer fireworks shall be conducted in consumer fireworks work buildings or consumer fireworks work rooms or areas in consumer fireworks storage buildings that meet the requirements of this chapter.

6.11.3 Exterior doors and windows shall be kept locked when the building is not occupied or otherwise attended.

6.11.4* Consumer fireworks shall be stored in accordance with NFPA 230, *Standard for the Fire Protection of Storage*, and as follows:

(1) Consumer fireworks shall be stored in DOT approved packaging. *(See 3.3.2.5.)*
(2) Cartons shall be stacked neatly and in a stable manner.
(3) Consumer fireworks returned to these buildings shall be permitted to be stored temporarily in cartons until repackaging or repacking can be performed.

6.11.5 Firearms, unless carried by authorized personnel or law enforcement personnel, shall not be permitted inside a consumer fireworks storage or work building, room, or area or within 15 m (50 ft) of stored consumer fireworks.

6.11.5.1 Smoking materials, matches, lighters, or open flame devices shall not be allowed within 15.2 m (50 ft) of any area where fireworks or other pyrotechnic materials are present.

6.11.5.1.1 Authorized smoking locations shall be so marked, shall contain designated receptacles for disposal of smoking materials, and shall be provided with at least one approved portable fire extinguisher for use on Class A fires.

6.11.5.2 Testing of fireworks, pyrotechnic materials, and pyrotechnic and explosive compositions shall be performed only in a building or area specifically designated for that purpose.

6.11.5.2.1 The testing shall be conducted at a safe distance from other buildings.

6.11.6 Signs that read as follows in letters not less than 102 mm (4 in.) high on a contrasting background shall be conspicuously posted on the outside of any consumer fireworks storage building:

FIREWORKS — NO SMOKING

6.11.7* The operator of each consumer fireworks storage or work building or area shall prepare a written emergency response plan that provides specific directions to be followed in the event of a fire.

6.12 Housekeeping.

6.12.1 No loose black powder or other exposed pyrotechnic composition shall be permitted. If loose composition is discovered, it shall be removed immediately and disposed of in an approved manner.

6.12.2 Consumer fireworks storage or work buildings, rooms or areas shall comply with the following:

(1) Interiors shall be kept clean, dry, and free of grit and rubbish.
(2) Tools used for cleaning up loose pyrotechnic composition shall not have spark-producing metal parts.
(3) Sweepings shall be disposed of in an approved manner.

6.12.3 The area around consumer fireworks storage or work buildings shall be kept clear of brush, dried vegetation, rubbish, and similar combustibles for a distance of at least 7.6 m (25 ft).

6.13 Consumer Fireworks Work Buildings, Rooms, or Areas.

6.13.1 Consumer fireworks work buildings, rooms, or areas shall also comply with this section.

6.13.2 The quantity of consumer fireworks being handled outside of DOT approved packaging shall be limited to that necessary to conduct the operation.

6.13.3 Aisles shall be at least 1.2 m (48 in.) wide and shall be kept free of obstructions that reduce the required width.

6.13.4 Exit doors shall be kept free of obstructions.

6.13.5 Work rooms or areas shall be permitted in consumer fireworks storage buildings.

6.13.5.1 Work rooms or areas in consumer fireworks storage buildings shall be separated from stored consumer fireworks by a fire barrier wall having a fire-resistance rating of at least 1 hour or by a separation distance of at least 7.6 m (25 ft).

6.13.5.2 Work rooms or areas in consumer fireworks storage buildings shall have at least two remotely located means of egress with at least one means of egress not having to pass through a storage area.

6.13.6 Light fixtures within 7.6 m (25 ft) of any consumer fireworks shall have guards.

6.14 Trailers, Semitrailers, and Metal Shipping Containers.

6.14.1 Trailers, semitrailers or metal shipping containers shall comply with this section.

6.14.2 Trailers, semitrailers or metal shipping containers that are not normally occupied shall be permitted to be locked during operation.

6.14.3 Where an aisle is provided, the aisle shall be not less than 710 mm (28 in.) in clear width.

6.14.4 At least one pressurized water type fire extinguisher having a minimum 2A rating shall be located within 22.8 m (75 ft).

6.14.5 Panic hardware on exit doors shall not be required.

6.14.6 Trailers, semitrailers, and metal shipping containers used for consumer fireworks storage shall be permitted to be placed side by side with no minimum separation distance and stacked to a maximum height of two units.

Chapter 7 Retail Sales of Consumer Fireworks

7.1 Applicability.

7.1.1 Retail sales of consumer fireworks in both new and existing buildings, structures, and facilities shall comply with the requirements of this chapter unless otherwise indicated.

7.1.2 The requirements of this chapter shall apply to the following:

(1) Permanent buildings and structures, including the following:
   (a) Stores
   (b) Bulk merchandising retail buildings
   (c) Consumer fireworks retail sales facilities
(2) Temporary facilities, including the following:
   (a) Consumer fireworks retail sales stands
   (b) Tents
   (c) Canopies
   (d) Membrane structures

7.1.3 Exempt Amounts.

7.1.3.1 The requirements of this chapter shall not apply to consumer fireworks retail sales facilities or stores where the consumer fireworks are in packages and where the total quantity of consumer fireworks on hand does not exceed 56.8 kg [125 lb (net)] of pyrotechnic composition or, in a building protected throughout with an approved automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, 113.6 kg [250 lb (net)] of pyrotechnic composition.

7.1.3.2 Where the actual weight of the pyrotechnic composition of consumer fireworks is not known, 25 percent of the gross weight of the consumer fireworks, including packaging, shall be permitted to be used to determine the weight of the pyrotechnic composition.

7.1.4 For the purpose of this chapter, stores and bulk merchandising retail buildings in which consumer fireworks retail sales are conducted shall not be considered consumer fireworks retail sales facilities as defined in Section 3.3 where both of the following conditions exist:

(1) The area of the retail sales floor occupied by the retail displays of consumer fireworks does not exceed 25 percent of the area of the retail sales floor in the building or 55.5 m^2 (600 ft^2), whichever is less.
(2) The consumer fireworks are displayed and sold in a manner approved by the authority having jurisdiction and comply with the applicable provisions of this code, federal and state law, and local ordinances.

7.1.5* Retail sales of consumer fireworks shall be limited to mercantile occupancies defined in NFPA *101®*, *Life Safety Code®*.

7.2 General Requirements for Retail Sales of Consumer Fireworks.

7.2.1 Display Fireworks and Pyrotechnic Articles. Retail sales of display fireworks and pyrotechnic articles, including the related storage and display for sale of such fireworks and articles, shall be prohibited at a consumer fireworks retail sales facility or store.

7.2.2 Consumer Fireworks. Retail sales of consumer fireworks, including their related storage and display for sale of such fireworks, shall be in accordance with this code.

7.2.3 Prohibited Explosive Devices. Retail sales of certain explosive devices prohibited by the Child Safety Act of 1966, including the related storage and display for sale of such devices, shall be prohibited at a consumer fireworks retail sales facility or store.

7.2.4 Pest Control Devices. The retail sales of pest control devices, including their related storage and display for sale, shall be prohibited.

7.2.5 Noncomplying Fireworks. The retail sales of fireworks that do not comply with the regulations of the U.S. Consumer Product Safety Commission as set forth in 16 CFR 1500 and 1507 and the regulations of the U.S. Department of Transportation as set forth in 49 CFR 100 to 178, including their related storage and display for sale, shall be prohibited.

7.2.6 Any building or structure used for the retail sales of consumer fireworks, including their related storage, shall comply with NFPA *101®*, *Life Safety Code®*, for mercantile occupancies, except as provided herein.

7.3 Permit Requirements.

7.3.1* Permits. Where required by state or local laws, ordinances, or regulations, a permit for the following shall be obtained:

(1) Construction, erection, or operation of the following:
   (a) Permanent building or structure
   (b) Temporary structure such as a stand, tent, or canopy used for the purpose of the retail display or sale of consumer fireworks to the public
(2) Storage of consumer fireworks in connection with the retail display or sale of consumer fireworks to the public

7.3.2 Plans.

7.3.2.1 Where required, plans for consumer fireworks retail sales facilities shall be submitted to the authority having jurisdiction with the permit application.

7.3.2.2 Plans for facilities other than stands and tents shall include the following:

(1) Minimum distances from the following:
   (a) Public ways
   (b) Buildings
   (c) Other consumer fireworks retail sales facilities
   (d) Motor vehicle fuel-dispensing stations
   (e) Retail propane-dispensing stations
   (f) Flammable and combustible liquid aboveground tank storage
   (g) Flammable gas and flammable liquefied gas bulk aboveground storage and dispensing areas within 91.5 m (300 ft) of the facility used for the retail sales of consumer fireworks

(2) Vehicle access and parking areas
(3) Location and type of portable fire extinguishers
(4) Floor plan and layout of storage and displays to indicate compliance with this chapter and applicable state or local laws, ordinances, or regulations
(5) Means of egress
(6) Construction details

7.3.2.3 The site plan for stands and tents shall show the location of the stand or tent on the site and indicate the minimum separation distances required by Section 7.7.

7.4 Construction.

7.4.1 Buildings and Structures. Consumer fireworks shall only be permitted to be sold at retail in any of the following buildings or structures, provided that any new building or structure does not exceed one story in height:

(1) Permanent buildings or structures constructed in accordance with the building code enforced by the authority having jurisdiction
(2) Tents, canopies, or temporary membrane structures complying with NFPA 102, *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures*
(3) Temporary structures constructed in accordance with this chapter
(4) Temporary consumer fireworks retail sales stands greater than 74 m^2 (800 ft^2) in area that also meet the requirements for a permanent structure
(5) Vehicles, such as vans, buses, trailers, recreational vehicles, motor homes, travel trailers, trucks, and automobiles, complying with the applicable requirements for consumer fireworks retail sales stands

7.4.2 Construction Materials. The following construction materials requirements shall apply to new permanent consumer fireworks retail sales facilities in jurisdictions that have not adopted a local building code:

(1) Buildings having an area up to and including 743 m^2 (8,000 ft^2) shall be permitted to be constructed of any approved construction materials.
(2) Buildings having an area greater than 743 m^2 (8,000 ft^2) shall be constructed in accordance with one of the following:
   (a) Buildings shall be constructed of noncombustible or limited-combustible materials.
   (b) Buildings with exterior walls having a fire resistance rating of not less than 2 hours shall be permitted to have the roof decking and its supporting structure and interior partitions constructed of combustible materials.
(3) Roof coverings for any building shall have a minimum rating of Class C as determined in accordance with NFPA 256, *Standard Methods of Fire Tests of Roof Coverings*.

7.4.3 Multiple-Tenant Buildings.

7.4.3.1 Where new consumer fireworks retail sales facilities are located in a building containing other tenants, the consumer fireworks retail sales facility shall be separated from the other tenants by fire barriers having a fire resistance rating of not less than 2 hours without openings.

7.4.3.2 Where the new building is protected per NFPA 13, *Standard for the Installation of Sprinkler Systems*, the fire resistance rating of the fire barrier in 7.4.3.1 shall be not less than 1 hour.

7.4.4 Storage Rooms. Storage rooms containing consumer fireworks in a new permanent consumer fireworks retail sales facility or store shall be protected with an automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, or separated from the retail sales area by a fire barrier having a fire resistance rating of not less than 1 hour.

7.4.4.1 Door and window openings in the fire barrier wall shall be protected by self-closing fire doors or fixed fire windows having a fire protection rating of not less than ¾ hour and shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*.

7.4.4.2 Any other openings or penetrations in the fire barrier wall shall be protected in accordance with NFPA *101®*, *Life Safety Code®*.

7.5 Fire Protection.

7.5.1 Automatic Sprinkler System.

7.5.1.1 An automatic sprinkler system shall be required and shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and shall be provided in permanent consumer fireworks retail sales facilities greater than 557.2 m^2 (6000 ft^2) in area.

7.5.1.2 The waterflow alarm device shall be arranged to activate audible and visual alarms throughout the facility in accordance with *NFPA 72®*, *National Fire Alarm Code®*.

7.5.2 Portable Fire Extinguishers.

7.5.2.1 Specification. Portable fire extinguishers shall be specified as required for extra (high) hazard occupancy in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

7.5.2.2 Minimum Number. Every consumer fireworks retail sales facility shall have not less than two portable fire extinguishers with a minimum 2A rating, at least one of which shall be of the pressurized water type.

7.5.2.2.1 Temporary consumer fireworks retail sales stands of less than 18.6 m^2 (200 ft^2) shall be required to have only one portable fire extinguisher.

7.5.2.2.2 Where more than one portable fire extinguisher is required, at least one fire extinguisher shall be of the multipurpose dry chemical type if the facility is provided with electrical power.

7.5.2.3 Location.

7.5.2.3.1 Portable fire extinguishers for permanent consumer fireworks retail sales facilities and stores shall be located so that the maximum distance of travel required to reach an extinguisher from any point does not exceed 23 m (75 ft) as specified in NFPA 10, *Standard for Portable Fire Extinguishers*.

7.5.2.3.2 Portable fire extinguishers for temporary consumer fireworks retail sales facilities shall be installed and located so that the maximum distance of travel required to reach an extinguisher from any point does not exceed 10.6 m (35 ft).

7.5.3 Fire Alarms.

7.5.3.1 A fire alarm system shall be provided as required by NFPA *101®*, *Life Safety Code®*.

7.5.3.2 In permanent consumer fireworks retail sales facilities greater than 278.6 m^2 (3,000 ft^2) in area and in Class B stores a public address system or a means for manually activating an

audible and visible alarm indicating devices located throughout the facility in accordance with *NFPA 72®*, *National Fire Alarm Code®*, shall be provided at a constantly attended location when the facility or store is occupied.

7.5.4 Smoke Control.

7.5.4.1 Smoke and heat vents designed and installed in accordance with NFPA 204, *Standard for Smoke and Heat Venting*, shall be provided in the consumer fireworks retail sales area of new permanent consumer fireworks retail sales facilities or stores where the ceiling height is less than 3.05 m (10 ft) and the travel distance to reach an exit is greater than 7.6 m (25 ft).

7.5.4.2 The smoke and heat vents shall be automatically activated by a smoke detection system installed throughout the consumer fireworks retail sales area in accordance with *NFPA 72®*, *National Fire Alarm Code®*.

7.6 Site Requirements.

7.6.1* Fire Department Access. Any portion of an exterior wall of a building, sidewall of a tent, or other defined perimeter of a consumer fireworks retail sales facility shall be accessible within 45.7 m (150 ft) of a public way or an approved fire apparatus access.

7.6.2 Clearance to Combustibles. The area located within 9 m (30 ft) of a consumer fireworks retail sales facility shall be kept free of accumulated dry grass, dry brush, and combustible debris.

7.6.3 Parking. No motor vehicle or trailer used for the storage of consumer fireworks shall be parked within 3 m (10 ft) of a consumer fireworks retail sales facility, except when delivering, loading, or unloading fireworks or other merchandise and materials used, stored, or displayed for sale in the facility.

7.6.4 Fireworks Discharge.

7.6.4.1 Fireworks shall not be ignited, discharged, or otherwise used within 91.5 m (300 ft) of a consumer fireworks retail sales facility or store.

7.6.4.2 At least one sign that reads as follows, in letters at least 102 mm (4 in.) high on a contrasting background, shall be conspicuously posted on the exterior of each side of the consumer fireworks retail sales facility:

NO FIREWORKS DISCHARGE WITHIN 300 FEET

7.6.5 No Smoking Signs.

7.6.5.1 Smoking shall not be permitted inside or within 15.5 m (50 ft) of the consumer fireworks retail sales area.

7.6.5.2 At least one sign that reads as follows, in letters at least 51 mm (2 in.) high on a contrasting background, shall be conspicuously posted at each entrance or within 3.05 m (10 ft) of every aisle directly serving the consumer fireworks retail sales area in a store:

FIREWORKS — NO SMOKING

7.7 Separation Distances.

7.7.1 Permanent Facilities.

7.7.1.1 New Facilities. New permanent consumer fireworks retail sales facilities shall be separated from adjacent permanent buildings and structures in accordance with Table 7.7.1.1.

Table 7.7.1.1 Separation Distances Between New Permanent Buildings and Structures

Separation Distances		Exterior Wall Fire Resistance Rating (hr)	Exterior Wall Opening Fire Protection Rating (hr)
m	ft		
< 3.05	< 10	2	1½
≥ 3.05 to < 18.3	≥ 10 to < 60	1	¾
≥ 18.3	≥ 60	0	0

7.7.1.2 Existing Facilities. Existing permanent consumer fireworks retail sales facilities shall be separated from adjacent permanent buildings and structures by not less than 3.05 m (10 ft) or shall be separated by a wall with a 1-hour fire resistance rating.

7.7.2 Temporary Facilities. Temporary consumer fireworks retail sales facilities shall be located as specified in Table 7.7.2.

7.7.3 Other Separation Distances.

7.7.3.1 Consumer fireworks retail sales facilities and stores shall not be located within 15.2 m (50 ft) of the following:

(1) Motor vehicle fuel-dispensing station dispensers
(2) Retail propane-dispensing station dispensers
(3) Aboveground storage tanks for flammable or combustible liquid, flammable gas, or flammable liquefied gas
(4) Compressed natural gas dispensing facilities

7.7.3.2 Consumer fireworks retail sales and storage areas shall not be located within 91.2 m (300 ft) of any aboveground bulk storage or bulk dispensing area for the following:

(1) Flammable or combustible liquid
(2) Flammable gas
(3) Flammable liquefied gas

7.7.3.3 Fuel tanks on vehicles or other motorized equipment shall not be considered bulk storage.

7.7.3.4 Fuel storage for generators shall be in accordance with 7.11.3.

7.8 Means of Egress.

7.8.1 General. Means of egress in consumer fireworks retail sales facilities shall comply with the applicable requirements of NFPA *101®*, *Life Safety Code®*, as modified by Section 7.8.

7.8.1.1 Means of egress in stores and bulk merchandising retail buildings where the retail sales of consumer fireworks are conducted shall comply with NFPA *101®*, *Life Safety Code®*, unless otherwise specified in Section 7.8.

7.8.1.2* Means of egress in tents and membrane structures used for consumer fireworks retail sales shall comply with NFPA *101®*, *Life Safety Code®*, and NFPA 102, *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures*, as modified by Section 7.8.

7.8.2* Fire Safety and Evacuation Plan.

7.8.2.1 For a consumer fireworks retail sales facility or store, an approved fire safety and evacuation plan shall be prepared in writing and maintained current.

Table 7.7.2 Temporary Consumer Fireworks Retail Sales Facilities — Minimum Separation Distances

	Buildings		Combustibles[a]		Tents[b]		Vehicle Parking		Stands[c]		Storage of Consumer Fireworks	
	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft
Tents[b]	6.1	20	6.1	20	6.1	20	3.05	10	6.1	20	6.1	20
Stands[c]	6.1	20	3.05	10	6.1	20	3.05	10	1.5[d]	5[d]	6.1	20

[a] The required clearances to combustibles shall also comply with 7.6.2.
[b] *Tents* refers to temporary consumer fireworks retail sales in tents, canopies, and membrane structures.
[c] *Stands* refers to temporary consumer fireworks retail sales stands.
[d] Where stands are separated from each other by less than 6.1 m (20 ft), the aggregate area of such stands shall not exceed 74 m^2 (800 ft^2).

7.8.2.2 The evacuation plan shall be posted in a conspicuous location that is accessible to the public as well as to persons employed or otherwise working in the facility.

7.8.2.3 An approved fire safety and evacuation plan shall not be required for temporary consumer fireworks retail sales stands.

7.8.3 Number of Exits.

7.8.3.1 The minimum number of exits provided from the retail sales area shall be not less than three or as determined in accordance with NFPA *101®*, *Life Safety Code*, whichever number is greater.

7.8.3.2 In Class C stores in which consumer fireworks retail sales are conducted and in temporary consumer fireworks retail sales stands, the minimum number of exits specified in 7.8.3.1 shall be permitted to be reduced from three to two.

7.8.4 Egress Travel Distance.

7.8.4.1 Exits provided for the retail sales area of tents, membrane structures, canopies, and permanent consumer fireworks retail sales facilities, including Class C stores, shall be located so that the maximum egress travel distance, measured from the most remote point to an exit along the natural and unobstructed path of egress travel, does not exceed 22.9 m (75 ft).

7.8.4.2 Exits provided for temporary fireworks retail sales stands shall be arranged so that the maximum egress travel distance does not exceed 10.6 m (35 ft).

7.8.5 Aisles. Aisles serving as a portion of the exit access in consumer fireworks retail sales facilities or within the consumer fireworks retail sales area of a store shall comply with this subsection.

7.8.5.1 Aisle Width.

7.8.5.1.1 Aisles shall have a minimum clear width of 1.2 m (48 in.).

7.8.5.1.2 The required width of aisles shall be maintained unobstructed at all times the facility is occupied by the public.

7.8.5.2 Minimum Clear Width. In temporary consumer fireworks retail sales stands where the interior is not accessible to the public, the minimum clear width of the aisle shall be permitted to be not less than 710 mm (28 in.).

7.8.5.3* Aisle Arrangements.

7.8.5.3.1 Not less than one aisle shall be provided and arranged so that travel along the aisle leads directly to an exit.

7.8.5.3.2 Other required exits shall be located at, or within 3.05 m (10 ft) of, the end of an aisle or cross aisle.

7.8.5.3.3 Aisles shall terminate at an exit, another aisle, or a cross-aisle.

7.8.5.3.4 Dead-end aisles shall be prohibited.

7.8.5.3.5 Where more than one aisle is provided, not less than one cross-aisle shall have an unobstructed connection with every aisle, other than cross-aisles.

7.8.5.3.6 Cross-aisle connections shall be provided for each aisle at intervals not greater than 15.2 m (50 ft) as measured along the aisle.

7.8.5.3.7 Where cross-aisles are required, not less than one cross-aisle shall have at least one end terminate at, or within 3.05 m (10 ft) of, an exit.

7.8.6 Doors and Doorways. Doors and doorways used in the means of egress shall comply with this subsection.

7.8.6.1 Egress doors shall be not less than 910 mm (36 in.) in width [providing a minimum of 813 mm (32 in.) clear width].

7.8.6.2 Exit openings from tents shall have a clear opening width of not less than 1,100 mm (44 in.).

7.8.6.3 Egress doors provided for temporary fireworks retail sales stands where the interior is not accessible to the public shall be permitted to be not less than 710 mm (28 in.) in width.

7.8.6.4 For other than temporary consumer fireworks retail sales stands where the interior is not accessible to the public, every egress door that has a latching device shall be provided with panic hardware complying with NFPA *101®*, *Life Safety Code®*.

7.8.6.5 Means of egress doors shall be of the side-hinge swinging type and shall be arranged to swing in the direction of egress travel.

7.9 Exit Signs and Emergency Lighting.

7.9.1 Exit Signs.

7.9.1.1 Exits shall be marked by an approved exit sign in accordance with NFPA *101®*, *Life Safety Code®*.

7.9.1.2 Exit signs shall be required to be self-luminous or internally or externally illuminated.

7.9.1.3 Exit signs shall not be required to be illuminated in tents or stands that are not open for business after dusk, or in temporary consumer fireworks retail sales stands where the interior is not accessible to the public.

7.9.2 Emergency Lighting.

7.9.2.1 The means of egress, including the exit discharge, shall be illuminated whenever the facility is occupied in accordance with NFPA *101®*, *Life Safety Code®*.

7.9.2.2 Emergency lighting shall be provided for consumer fireworks retail sales facilities and stores and shall comply with NFPA *101®*, *Life Safety Code®*.

7.9.2.3 Emergency lighting shall not be required in tents or stands that are not open for business after dusk or for temporary consumer fireworks retail sales stands where the interior is not accessible to the public.

7.10* Retail Sales Displays.

7.10.1 General. The requirements of this section shall apply only to consumer fireworks retail sales facilities and stores where the retail sales of consumer fireworks are conducted, unless otherwise specifically indicated.

7.10.2* Height of Sales Displays. To provide for visual access of the retail sales area by the employees and customers, partitions, counters, shelving, cases, and similar space dividers shall not exceed 1.8 m (6 ft) in height above the floor surface inside the perimeter of the retail sales area.

7.10.2.1 Merchandise on display or located on shelves or counters or other fixtures shall not be displayed to a height greater than 1.8 m (6 ft) in height above the floor surface within the retail sales area.

7.10.2.2 Where located along the perimeter of the retail sales area, the maximum height of sales displays shall be limited to 3.66 m (12 ft).

7.10.2.3 In temporary consumer fireworks retail sales stands where the interior is not accessible to the public, the maximum height of sales displays shall be limited to 2.44 m (8 ft).

7.10.3* Flame Breaks.

7.10.3.1 Where continuous displays of merchandise are located on shelving, cases, counters, and similar display fixtures, a flame break shall be provided so that the maximum distance between flame breaks does not exceed 4.9 m (16 ft) where measured along the length of the display.

7.10.3.2 Flame breaks shall not be required in consumer fireworks retail sales facilities or stores protected with an automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

7.10.3.3 The flame break shall extend as follows:

(1) From the display surface to not less than 150 mm (6 in.) above the full height of the displayed merchandise or to the underside of the display surface directly above
(2) For the full depth of the displayed merchandise

7.10.3.4* Where packaged fireworks merchandise is displayed on the same level as individual unpackaged fireworks devices, a flame break shall not be required where both of the following criteria are met:

(1) The length of the display level containing individual unpackaged fireworks devices is interrupted by packaged fireworks merchandise, or open space, or any combination thereof, having a continuous length of not less than 2.4 m (8 ft).
(2) The distance between flame breaks does not exceed 9.8 m (32 ft).

7.10.3.5 Where a merchandise display level contains packaged fireworks merchandise, such merchandise shall be permitted to be displayed in a continuous length on the same level where the display does not exceed 9.8 m (32 ft) without a flame break.

7.10.3.6 An aisle having a minimum width of 1.1 m (44 in.) shall be permitted to substitute for a flame break.

7.10.3.7 Where displays of merchandise face aisles that run along both long sides of the display fixtures or display surface, a flame break shall be installed lengthwise between the abutting display fixtures or along the approximate longitudinal centerline of the display surface so as to separate the merchandise facing one of the aisles from the merchandise that abuts it facing the other aisle.

7.10.3.7.1 In consumer fireworks retail sales facilities where one of the aisles does not serve as part of the means of egress for the public, the flame break required in 7.10.3.7 shall not be required.

7.10.3.7.2 Freestanding display racks, pallets, tables, or bins containing packaged fireworks merchandise shall be permitted without flame breaks, provided the dimensions of the area occupied by the fireworks merchandise do not exceed 1.2 m (4 ft) in width, 2.4 m (8 ft) in length, and 1.8 m (6 ft) in height, and the displayed fireworks merchandise is separated from other displays of merchandise by aisles having a minimum clear width of 1.2 m (4 ft).

7.10.3.7.3 Where both of the facing vertical surfaces of the abutting display fixtures are constructed of perforated hardboard panels not less than 6 mm (¼ in.) thick which are separated from each other by an open space not less than 38 mm (1½ in.) wide, a flame break shall not be required as specified in 7.10.3.7.

7.10.3.8 Shelving.

7.10.3.8.1 Shelving or other surfaces used to support fireworks display merchandise shall be permitted to have not more than 10 percent of the area of the shelf contain holes or other openings.

7.10.3.8.2 The 10 percent limitation on the area of holes or other openings in the metal shelf used to support fireworks display merchandise shall not be applicable under the following conditions:

(1) Where both of the facing vertical surfaces of the abutting display fixtures are constructed of perforated hardboard panels not less than 6 mm (¼ in.) thick, which are separated from each other by an open space not less than 38 mm (1½ in.) wide
(2) Where such merchandise is suspended from or fastened to the shelf or surface or is displayed as packaged merchandise on the surface or in bins

7.10.3.9 Flame breaks and solid display surfaces shall not be required for packaged fireworks merchandise displayed in bins or display racks or on pallets or tables located at the end of a row of display fixtures where the following conditions are met:

(1) Such end displays shall be separated from the ends of the display fixtures by an open space not less than 76 mm (3 in.) wide.
(2) The fireworks merchandise shall occupy an area having dimensions not greater than the width of the end of the row of display fixtures and a depth not greater than 910 mm (36 in.).
(3) The minimum required widths of the adjacent aisles shall be maintained, but in no case shall the aisle width be less than 1.2 m (48 in.).

7.10.3.10 Temporary consumer fireworks retail sales stands where the interior is not accessible to the public shall not be required to comply with 7.10.3.

7.10.4 Covered Fuses. Only consumer fireworks meeting the criteria for covered fuses as defined in Section 3.3 or as described in 7.10.4.1 shall be permitted in a facility in which the retail sales of consumer fireworks are conducted.

7.10.4.1 A consumer fireworks device shall also be considered as having a covered fuse if the fireworks device is contained within a prepackaged arrangement, container, or wrapper that is arranged and configured, such that the fuse of the fireworks device cannot be touched directly by a person handling the fireworks without the person having to puncture or tear the packaging or wrapper, unseal or break open a package or container, or otherwise damage or destruct the packaging material, wrapping, or container within which the fireworks are contained.

7.10.4.2 Individual consumer fireworks items displayed for sale in temporary consumer fireworks retail sales stands where the interior is not accessible to the public shall not be required to have covered fuses.

7.10.5 Sales in Stores. Consumer fireworks displayed for sale in stores shall comply with the following:

(1) Such fireworks shall be under the visual supervision of a store employee or other responsible party while the store is open to the public.
(2) Such fireworks shall be packaged fireworks merchandise.
(3)*Such fireworks shall be packaged and displayed for sale in a manner that will limit travel distance of ejected pyrotechnic components if ignition of the fireworks occurs.
(4) Where consumer fireworks meeting the requirements of C.3.1.2 or C.3.1.3 for aerial devices and audible ground devices, respectively, are sold, such devices shall be displayed for sale in an area of the store that is physically separated from the rest of the store in a manner that restricts entry by the public and the area of the store shall be provided with not less than two means of egress so located, that there is no common path of travel and the distance to reach an egress point from the area does not exceed 10.7 m (35 ft).

7.10.6* Aerial Devices. Aerial devices shall be packaged and displayed for sale in a manner that will limit travel distance of ejected pyrotechnic components if ignition of the fireworks occurs.

7.10.7* Combustible materials and merchandise shall not be stored directly above the consumer fireworks in retail sales displays unless a horizontal barrier is installed directly above the consumer fireworks as prescribed in 7.4.1(e) of NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers.*

7.11 Equipment.

7.11.1 Electrical Equipment. All electrical wiring shall be in accordance with NFPA 70, *National Electrical Code®*.

7.11.1.1 Battery powered equipment, electrical equipment, and electrical cords that are used in conjunction with a consumer fireworks retail sales facility area shall be listed and shall be used in accordance with their listing.

7.11.1.2 Temporary wiring installed in a temporary structure including tents and canopies shall comply with Article 305 of NFPA 70, *National Electrical Code®*.

7.11.1.3 Where temporary electrical conductors are placed on top of an outdoor surface to connect the permanent power source to the temporary consumer fireworks retail sales facility's temporary electrical system, the conductors shall be provided with physical protection against damage caused by pedestrian or vehicular traffic.

7.11.2 Heating Sources.

7.11.2.1 Heating units shall be listed and shall be used in accordance with their listing.

7.11.2.2 Temporary heating sources shall have tip-over and temperature-overheat protection.

7.11.2.3 Open-flame and exposed-element heating devices shall be prohibited.

7.11.3 Portable Generators.

7.11.3.1 Portable generators supplying power to consumer fireworks retail sales facilities shall use only Class II or Class III combustible liquid fuels.

7.11.3.2 Portable generators shall be located not less than 6.1 m (20 ft) from the consumer fireworks retail sales facility.

7.11.3.3 Class II and Class III combustible liquid generator fuel shall be limited to not more than 18.9 L (5 gal).

7.11.3.4 Portable generators shall be permitted to use Class I flammable liquids as fuel provided the quantity of such fuel is limited to 7.6 L (2 gal).

7.11.3.5 Generator fuels shall be stored not less than 6.1 m (20 ft) from the consumer fireworks retail sales facility.

7.11.3.6* Where the generator fuel storage is located not less than 15.2 m (50 ft) from the consumer fireworks retail sales facility, the quantity of such fuel shall not be limited by 7.11.3.

7.11.4 Cooking Equipment.

7.11.4.1 Cooking equipment of any type shall not be permitted within 6.1 m (20 ft) of tents, canopies, or membrane structures used for the storage or sale of consumer fireworks.

7.11.4.2 Open flame cooking equipment of any type shall not be allowed within 15.2 m (50 ft) of tents, canopies, or membrane structures used for the storage or sale of consumer fireworks.

7.12 Operations.

7.12.1 General.

7.12.1.1 Means of egress including, but not limited to aisles, doors, and exit discharge, shall be clear at all times when the facility or the building is occupied.

7.12.1.2 Customers shall not be permitted inside a temporary consumer fireworks retail sales stand unless it complies with the means of egress requirements in Section 7.8.

7.12.2 Distances from Entrances and Exits.

7.12.2.1 No consumer fireworks shall be displayed for sale or stored within 1.5 m (5 ft) of any public entrance in an enclosed building or structure.

7.12.2.2 No consumer fireworks shall be displayed for sale or stored within 0.6 m (2 ft) of any public exit, or private entrance or exit in an enclosed building or structure.

7.12.3 Security.

7.12.3.1 Consumer fireworks retail sales facilities and stores shall be secured when unoccupied and not open for business, unless fireworks are not kept in the facility during such times.

7.12.3.2 The fireworks displayed or stored in the facility shall be permitted to be removed and transferred to a temporary storage structure or location.

7.12.4 Display and Handling.

7.12.4.1 The following shall apply to the sales display of consumer fireworks in temporary consumer retail sales stands that do not allow access to the interior of the stand by the public:

(1) Consumer fireworks shall be displayed in a manner that prevents the fireworks from being handled by persons other than those operating, supervising, or working in the temporary consumer fireworks retail sales stand.
(2) The handling requirements of (1) shall not apply to packaged assortments, boxes, or similarly packaged containers of one or more items, regardless of type.

7.12.4.2 The floor area occupied by the retail displays of consumer fireworks in permanent consumer fireworks retail sales facilities shall not exceed 40 percent of the available floor area within the retail sales area.

7.12.4.3 Not less than 50 percent of the available floor area within the retail sales area shall be open space that is unoccupied by retail displays and used only for aisles and cross-aisles.

7.12.5* Housekeeping.

7.12.5.1 Consumer fireworks retail sales areas and storage rooms shall be kept free of accumulations of debris and rubbish.

7.12.5.2 Any loose pyrotechnic composition shall be removed immediately.

7.12.5.3 Vacuum cleaners or other mechanical cleaning devices shall not be used.

7.12.5.4 Brooms, brushes, and dustpans used to sweep up any loose powder or dust shall be made of non-sparking materials.

7.12.5.5 Consumer fireworks devices that are damaged shall be removed and not offered for sale.

7.12.5.6 Damaged consumer fireworks shall be permitted to be returned to the dealer or shall be disposed of properly.

7.12.6* Training. All personnel handling consumer fireworks shall receive safety training related to the performance of their duties.

7.12.7 Under the Influence. Any person selling consumer fireworks shall not knowingly sell consumer fireworks to any person who is obviously under the influence of alcohol or drugs.

7.13 Records.

7.13.1 Records shall be maintained on available inventory on the premises.

7.13.2 Records shall be made available to the authority having jurisdiction upon request.

Chapter 8 Transportation of Fireworks, Pyrotechnic Articles, and Any Component(s) Containing Pyrotechnic or Explosive Materials on Public Highways

8.1 General Requirements. Transportation of fireworks, pyrotechnic articles, and any component(s) containing pyrotechnic or explosive materials shall meet all applicable requirements of the U.S. Department of Transportation (U.S. DOT), 49 CFR, 170 to end, and any applicable local, state, or international requirements.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.3 Code. The decision to designate a standard as a "code" is based on such factors as the size and scope of the document, its intended use and form of adoption, and whether it contains substantial enforcement and administrative provisions.

A.3.2.5 Listed. The means for identifying listed equipment may vary for each organization concerned with product evalu-

ation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.1 Aerial Shell. The shells are most commonly 76 mm to 152 mm (3 in. to 6 in.) outside diameter and are fired from mortars. Upon firing of the shell, the fuse and lift charge are consumed.

A.3.3.5.3 Screen Barricade. Such barricades can be constructed of metal roofing, 6-mm to 13-mm (¼-in. to ½-in.) mesh screen, or equivalent material.

A.3.3.7 Binary System. The ingredients for such a system are shipped separately as an oxidizer and a fuel. The ingredients do not become a pyrotechnic material until they are mixed.

A.3.3.9.1 Bulk Merchandising Retail Building. A bulk merchandising retail building is considered to be a store, as defined in Section 3.1. Thus, a bulk merchandising retail building also needs to be classified as a Class A, Class B, or Class C mercantile occupancy (store) in order to apply this code. These facilities are usually called "big box" stores within the retail sales industry. Their interiors look like a cross between a rack storage warehouse and a department store.

A.3.3.9.2 Consumer Fireworks Storage Building. Consumer fireworks storage buildings are typically found at manufacturing or distribution facilities and are not considered to be process buildings, rooms, or areas.

A.3.3.9.3 Consumer Fireworks Work Building, Room, or Area. Work buildings, rooms or areas are typically found at manufacturing or distribution facilities and are considered nonprocess buildings, rooms or areas.

A.3.3.9.4 Inhabited Building. The term includes any church, school, store, railway passenger station, airport passenger terminal, and any other building or structure where people are accustomed to congregate or assemble. This term does not include any building or structure occupied in connection with the manufacture, transportation, storage, distribution, packing, packaging, shipping or use of explosive materials or fireworks at a manufacturing or distribution facility.

A.3.3.9.5 Mechanical Building. A mechanical building is intended to be an unoccupied building.

A.3.3.9.6 Mixing Building. This definition does not apply to wet sparkler mix preparation.

A.3.3.9.7 Nonprocess Building. A pyrotechnic laboratory is considered to be a nonprocess building, but it is subject to the required separation distances for a consumer fireworks process building.

A.3.3.9.8 Process Building. Examples of operations performed in a process building include but are not limited to the following:

(1) Assembling internal component parts or exposed pyrotechnic compositions into finished fireworks
(2) Mixing pyrotechnic or explosive compositions
(3) Pressing pyrotechnic or explosive compositions
(4) Drying of newly manufactured fireworks or pyrotechnic articles or their compositions
(5) Packing of finished fireworks or pyrotechnic articles
(6) Any combination of these operations

A.3.3.9.11 Unoccupied Building. An unoccupied building can be used for long-term storage of materials acceptable to the authority having jurisdiction, provided that no fireworks or pyrotechnic composition is stored within the building.

A.3.3.19 Consumer Fireworks Retail Sales Stand. Stands can include, but are not limited to, small buildings, plywood or sheet metal structures, manufactured buildings, semitrailers, trailers, shipping containers, or similar structures or facilities.

A.3.3.22 Covered Fuse. The purpose of the covered fuse is to minimize the accidental ignition of fireworks in a retail display by a lighted cigarette or a match, a cigarette lighter, or similar small open flame, as well as to reduce the potential for the rapid involvement of fireworks in, and the subsequent acceleration of, a fire originating within a retail display of consumer fireworks.

Protection of the fuse can be provided by means of tape covering the exposed (ignitible) end of a safety fuse or by covering the fuse or the entire fireworks device or group of fireworks devices with paper, plastic, cardboard, paperboard, or similar or equivalent materials.

Examples of covered fuses of fireworks devices include those contained within packaged assortments, multi-item packages, and similar retail merchandise arrangements that are displayed within unopened and unperforated containers so that they are not exposed to view, or they are covered with, or are contained within, plastic wrap, paper, paperboard, cardboard, or other types of wrapping or packaging materials designed to prevent the fuses from coming into direct contact with an ignition source.

A.3.3.25 DOT Approved Packaging. DOT approved packaging for consumer fireworks typically consists of sealed fiberboard cartons that have been tested and certified to meet the performance requirements specified in Part 178 of 49 CFR. Cartons are required to be marked and labeled in compliance with DOT regulations to indicate that fireworks are contained in the packagings.

A.3.3.27 Explosive. This term includes but is not limited to dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, and igniters. The term explosive includes any materials determined to be within the scope of 18 USC, Chapter 40, "Importation, Manufacture, Distribution, and Storage of Explosive Materials," and also includes any materials classified as an explosive by the Hazardous Materials Regulations of the U.S. Department of Transportation (U.S. DOT). See Annex E.

A.3.3.29.3 Manufacturing Facility. The following operations are not considered to be manufacturing where performed in a separate building or area:

(1) Assembly of display pieces from finished pyrotechnic articles classed as Explosive 1.4
(2) Minor repairs or modification of consumer fireworks not involving exposed pyrotechnic material
(3) Packing of finished consumer fireworks into consumer fireworks assortments
(4) Attachment of electric matches and minor repairs to display fireworks and pyrotechnic articles

A.3.3.30 Fireworks. Toy caps for use in toy pistols, toy canes, toy guns, and novelties and trick noisemakers are not considered to be fireworks *(see Annex C)*. The regulations referred to limit the explosive content of each toy cap to not more than an average of 16.2 mg (0.25 gr). Also, each package containing

such caps has to be labeled to indicate the maximum explosive content per cap. For information on the use of model rockets and model rocket motors, see NFPA 1122, *Code for Model Rocketry*. Model rockets and model rocket motors designed, sold, and used for the purpose of propelling recoverable aero models are not considered to be fireworks.

A.3.3.30.2 Consumer Fireworks (Formerly Known as *Common Fireworks*). Consumer fireworks are normally classed as Explosives, 1.4G and described as Fireworks, UN 0336 by the U.S. Department of Transportation (U.S. DOT) *(see Annex C)*. Some small devices designed to produce audible effects are included, such as whistling devices, ground devices containing 50 mg (0.8 gr) or less of explosive composition (salute powder), and aerial devices containing 130 mg (2 gr) or less of explosive composition (salute powder) per explosive unit. Consumer fireworks contain limited quantities of pyrotechnic composition per unit and do not pose a mass explosion hazard where stored. Therefore, they are not required to be stored in a magazine.

A.3.3.30.3 Display Fireworks (Formerly Known as *Special Fireworks*). Display fireworks are described as Fireworks, UN 0335 and are classed as Explosives, 1.3G by the U.S. Department of Transportation (U.S. DOT) *(see Annex C)*.

Display fireworks include, but are not limited to, the following:

(1) Salutes containing more than 130 mg (2 gr) of explosive composition (salute powder)
(2) Aerial shells containing more than 60 g (2.1 oz) of total pyrotechnic and explosive composition
(3) Other display pieces that exceed the limits for classification as consumer fireworks

A.3.3.33 Fuel. Fuel is an ingredient of pyrotechnic materials.

A.3.3.38 Manufacturing. The following operations are not considered to be manufacturing where performed in a separate building or area:

(1) Assembly of display pieces from finished pyrotechnic articles classed as Explosive 1.4
(2) Minor repairs or modification of consumer fireworks not involving exposed pyrotechnic material
(3) Packing of finished consumer fireworks into consumer fireworks assortments
(4) Attachment of electric matches and minor repairs to display fireworks and pyrotechnic articles

A.3.3.40.2 Bullet-Sensitive Explosive Material. The test material is at a temperature of 21°C to 24°C (70°F to 75°F) and is placed against a 12.7-mm (½-in.) steel plate.

A.3.3.40.5 Pyrotechnic Material (Pyrotechnic Special Effects Material). Such a chemical mixture consists predominantly of solids capable of producing a controlled, self-sustaining, self-contained exothermic chemical reaction that results in heat, gas, sound, or light, or a combination of these effects. The chemical reaction functions without external oxygen.

A.3.3.47 Novelties and Trick Noisemakers. For further information, see Annex C.

A.3.3.48 Oxidizer. Where such a chemical decomposes, it releases oxygen. In addition to ionic solids, an oxidizer can be a material having covalent molecules containing halogen atoms. An oxidizer is an ingredient of pyrotechnic materials.

A.3.3.53 Packaged Fireworks Merchandise. Packaged fireworks merchandise are generally fireworks items or groups of fireworks items that have been packaged by the manufacturer or distributor before they are offered for sale to the consumer. The packaging arrangement completely encapsulates the fireworks item or items within paperboard, cardboard, plastic wrap, or similar materials or combinations of materials. Such encapsulation ensures that a person must puncture, tear, unseal, or break open the package or otherwise damage or destroy the packaging materials in order to gain access to, and directly handle, each individual fireworks item to expose its fuse.

A.3.3.59 Pyrotechnic Laboratory. A pyrotechnic laboratory typically processes small batches of chemicals and compositions, manufactures prototypes, or conducts a variety of tests and analyses. See Process Building, Section 3.3, and 4.9.9.

A.3.3.71 Stars. Stars burn while in the air, producing color or streamer effects.

A.3.3.73 Store. Stores are subclassified as Class A, Class B, or Class C in accordance with NFPA *101®*, *Life Safety Code®*.

A.4.5.2 For information on the use of conductive surfaces to minimize the hazard of static electricity, see 20.3.6 of NFPA 99, *Standard for Health Care Facilities*.

A.4.5.5.1 In general, the wall having the largest area should be chosen to provide explosion relief. The entire area of the wall should be utilized. The term *weakwall* is used to describe the relative strength of the explosion-relieving wall as compared to the rest of the building.

A.4.7.1(3) A bullet-resistant roof should be constructed according to any of the specifications in Annex B. A bullet-resistant ceiling should be constructed at the eave line, covering the entire area of the magazine, except for the necessary ventilation space. Examples of bullet-resistant ceiling construction include the following:

(1) Any construction meeting the specifications in Annex B
(2) A sand tray having a sand depth of at least 101.6 mm (4 in.)

A.4.8.3.1 The use of barricades is highly recommended.

A.4.9 The maximum quantity of salute powder that is permitted in any process building or area is 4.5 kg (10 lb).

A.4.10.2 Where sufficient separation distances exist, the Regional Director of the Bureau of Alcohol, Tobacco and Firearms can grant a variance from this requirement upon written request.

A.4.11.2.3 Smoking materials include matches, lighters, cigarettes, cigars, and pipes.

A.4.11.5 Care should be exercised, since some oxidizers are mutually incompatible. The NFPA *Fire Protection Guide to Hazardous Materials*, which contains the former NFPA 491, *Guide to Hazardous Chemical Reactions*, lists many oxidizers and other materials that result in hazardous interactions. Oxidizers commonly include nitrates, chlorates, and perchlorates.

A.4.11.6 Where practicable, nonsparking machinery and tooling should be used. To the extent practical, ferrous metals should be covered with nonsparking coatings such as epoxy paint.

A.4.13 For information on fireworks classification testing, contact the following agencies:

(1) U.S. Bureau of Mines, Columbia Plaza, 2401 E Street, NW, Washington, DC 20241.
(2) Bureau of Explosives, c/o Association of American Railroads, 50 F Street, NW, Washington, DC 20001.

A.4.14.1 This requirement minimizes personnel exposure and is distinct from any requirement on maximum building occupancy that might exist in local ordinances.

A.4.16.5.2(3) As a minimum, each shell should bear a label containing the following information:

(1) Description of the size of the shell [e.g., 76-mm (3-in.) shell]
(2) Description of the type of shell (for example, 2-break with report)
(3) Warning statement that reads as follows:
WARNING: DANGEROUS EXPLOSIVE. IF FOUND, DO NOT HANDLE. CONTACT LOCAL FIRE OR POLICE DEPARTMENT.
(4) Name and location of the business of the manufacturer, importer, or distributor, with conspicuous labeling as follows:
   (a) The following statement should be printed in capital letters at least 3 mm (⅛ in.) high and be underlined: WARNING: DANGEROUS EXPLOSIVE
   (b) The remaining printed matter does not need to be printed in capital letters, but the letters should be at least 3 mm (⅛ in.) high.
   (c) The required statements should be printed in a color that contrasts sharply with the background and should be printed within a borderline.
   (d) The label should be at least 58 cm^2 (9 $in.^2$), unless the size of the shell is too small to accommodate a label of such size, in which case the label should be reduced to a size no smaller than necessary.

A.5.2.2 Corresponding grades and brands of explosive materials should be stored together so that brand and grade markings are readily visible. All stock should be stored so it can be easily counted and checked.

A.5.2.3 Where explosive materials are removed from the magazine for use, the oldest stock should be used first.

A.5.2.5 Open containers of explosive materials should be closed securely before being returned to a magazine. No container without a closed lid should be stored in a magazine.

A.5.4.3 Net weight equals the net weight of all pyrotechnic and explosive compositions and fuse only. For display fireworks, approximately 50 percent of the gross weight of the fireworks equals the net weight of composition and fuse.

A.6.1.1 Requirements for consumer fireworks stored in conjunction with the retail sales of consumer fireworks at a consumer fireworks retail sales facility or store should be in accordance with Chapter 7, Retail Sales of Consumer Fireworks.

A.6.1.6 Devices that are lacking labeling, ornamentation, or bases are considered to be finished for the purposes of Chapter 6.

A.6.5.1 Where consumer fireworks storage buildings are subdivided with fire walls meeting the requirements of *NFPA 5000™, Building Construction and Safety Code™*, so that no area exceeds 12,000 ft^2, an automatic sprinkler system is not required since each area is considered a separate building.

A.6.6.1 An approved fire apparatus access is generally considered to be a paved road or other suitable all-weather surface, such as gravel or compacted earth, that can accommodate a typical fire department vehicle such as a pumper. Such access is not required to be a public street or alley but it is to be laid out and designed so that it can be readily used by the responding fire department under all weather conditions without unduly impeding the fire department's access to the building or facility.

A.6.7.1 In jurisdictions where a local building code is adopted and enforced, separation distances are usually measured to property lines, except where there are two or more buildings located on the same property. In that case, an imaginary or assumed property line is generally assumed to be located somewhere between the buildings for the purpose of determining the required separation distance between the buildings. Otherwise, the buildings can be treated as one building for the purpose of applying building code requirements or the requirements in Chapter 6. However, it is the intent of this section to specify the minimum separation distance necessary to minimize the propagation of fire by transmission of ejected burning materials. This distance is required between buildings, not between buildings and property lines whether real, imagined, or assumed.

A.6.10 Extension cords should be approved and listed, minimum 14 gauge.

A.6.11.4 Where pile heights exceed 3.7 m (12 ft), aisle widths should be increased proportionally so as to maintain the 4:1 ratio between pile height and aisle width.

A.6.11.7 The operator of each consumer fireworks storage or work building or area should train employees at least once a year using the written emergency response plan.

A.7.1.5 This requirement is not intended to preclude the retail sales of consumer fireworks in occupancies that may be classified as Group H High Hazard (Hazardous) by a building code.

A.7.3.1 Specific information and requirements for permits can be found in Section 1, NFPA 1, *Uniform Fire Code™*, for those jurisdictions that have not adopted a building code or fire code.

A.7.6.1 An approved fire apparatus access is generally considered to be a paved road or other suitable all-weather surface, such as gravel or compacted earth, that can accommodate a typical fire department vehicle such as a pumper. Such access is not required to be a public street or alley but it is to be laid out and designed so that it can be readily used by the responding fire department under all weather conditions without unduly impeding the fire department's access to the facility.

A.7.8.1.2 NFPA 102, *Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures*, has been referenced for the purpose of determining the requirements for the means of egress in tents and membrane structures except as modified by Section 7.8 for special requirements for the retail sales of consumer fireworks. It should be noted that although 9.2.5 of NFPA 102 prohibits fireworks in any tent or temporary membrane structure, the intent is to prohibit the use, discharge, or ignition of fireworks within the tent or temporary membrane structure since unauthorized open flames are also prohibited in the same section. Consumer fireworks in and of themselves do not pose an unusual fire hazard when stored or placed on display for retail sales within a tent or temporary membrane structure unless they are actually ignited or discharged. Chapter 7 in this code contains several provisions that specifically deal with how fireworks can be safely displayed or stored in tents or temporary membrane structures for the purpose of selling them at retail. Those requirements are an effort to minimize the fire hazard associated with such fireworks.

A.7.8.2 Fire safety and evacuation plans should be prepared by the owner or operator of the consumer fireworks retail sales facility or store in consultation with the authority having jurisdiction.

A.7.8.5.3 The purpose of 7.8.5.3 is to ensure that a readily available path of travel is provided to reach the required exits and that such travel can occur under emergency conditions without significant impedance by the aisle arrangement. In fact, cross-aisles are required to facilitate access to alternate aisles and paths of travel in case an aisle or path of travel is blocked by an incident. An example of how the requirements of 7.8.5.3 would be implemented for the design of an exit access aisle system in a consumer fireworks retail sales facility is shown in Figure A.7.8.5.3.

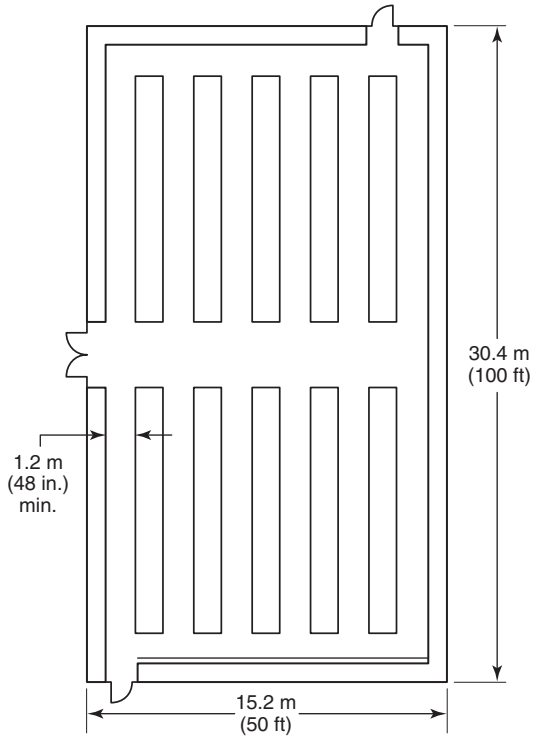

FIGURE A.7.8.5.3 Typical Design for Exit Access Aisle System in Consumer Fireworks Retail Sales Facility.

A.7.10 Consumer fireworks sealed in packaging meeting U.S. DOT standards for shipping would not be considered to be on display.

A.7.10.2 The ability to view the entire retail sales area is important for several reasons. For employees, such visibility allows easier supervision of the customers and helps to minimize the possibility of malicious mischief, such as the willful setting of fires in the fireworks merchandise displays. It also allows employees to quickly observe and respond to an incipient fire condition. Response might include the following:

(1) Evacuation of the occupants
(2) Notification of the local fire department
(3) Initiation of a fire attack using the fire extinguishers in the facility, provided that the fire is still small enough

For the customers, such visibility allows them also to quickly see a developing fire condition and react accordingly. Exits and their corresponding paths of travel are more easily observed, thus minimizing panic and facilitating evacuation in a timely manner. Full visibility can be easily achieved by keeping the height of displays and displayed merchandise within the retail sales area below adult eye level. Where displays located around the perimeter of the retail sales area don't impact the ability to view the area, it is not necessary to limit their height. However, if it is desirable to have higher displays of merchandise within the retail sales area, equivalent means of achieving full visibility should be employed, such as the use of unobstructed surveillance mirrors strategically located throughout the sales area or the addition of more employees who can walk the sales floor and monitor the customers.

A.7.10.3 Flame breaks can be constructed of any of the following:

(1) Sheet steel
(2) Sheet aluminum not less than 0.25 mm (0.010 in.) thick
(3) Hardboard not less than 3 mm (⅛ in.) thick
(4) Gypsum board not less than 10 mm (⅜ in.) thick
(5) Wood panels not less than 3 mm (⅛ in.) thick
(6) Plywood not less than 6 mm (¼ in.) thick
(7) Particleboard not less than 6 mm (¼ in.) thick
(8) Cement fiberboard
(9) Plastic laminate not less than 3 mm (⅛ in.) thick
(10) Safety glass not less than 3 mm (⅛ in.) thick
(11) Other approved material

Where installed within a retail display fixture containing consumer fireworks, the flame break should impede or retard the rapid spread of an incipient fire involving the fireworks and their packaging materials as any of the following occurs:

(1) The fire progresses along a display level or shelf
(2) The fire attacks another display level or shelf above
(3) The fire attacks another display fixture abutting the display fixture of origin.

As a result of installing flame breaks to impede fire spread, the quantity and rate of smoke production can be retarded as well. Thus, flame breaks can provide the building occupants with additional time to react to an incipient fire and safely evacuate the building. See Figure A.7.10.3.

A.7.10.3.4 The purpose of specifying packaged fireworks merchandise is to permit such merchandise to be used in longer lengths of displays of consumer fireworks without the installation of a flame break. It is presumed that packaged fireworks merchandise do not readily ignite when exposed to a fire developing within the retail display area merchandise and do not readily contribute to or accelerate a fire that might spread along the surface of a display. See Figure A.7.10.3.4. Since the purpose of a flame break is to slow down the rapid spread of a fire involving a retail display of consumer fireworks to allow occupants time to react and evacuate the immediate area, properly packaged fireworks merchandise can also serve the purpose of a flame break. For a description of packaged fireworks merchandise, see A.3.3.20, Covered Fuse.

A.7.10.5(3) This item describes performance criteria for how consumer fireworks displayed for sale in stores are to be packaged and displayed and appropriately restrained as needed depending upon the device and the manner in which it is packaged and displayed. Thus, upon ignition by a fire in the retail sales display area containing consumer fireworks, the resultant effect of the ejection of pyrotechnic components will

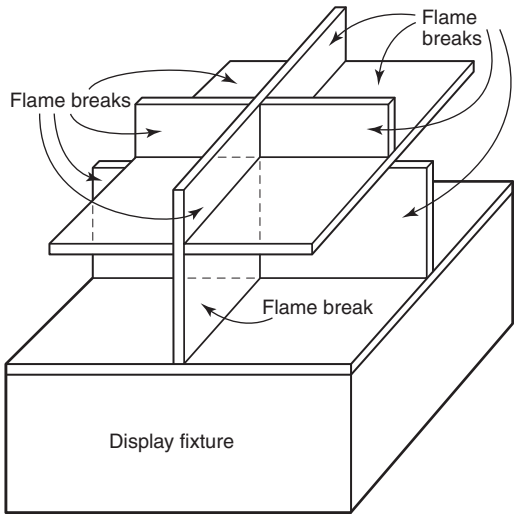

FIGURE A.7.10.3 Flame Break Design.

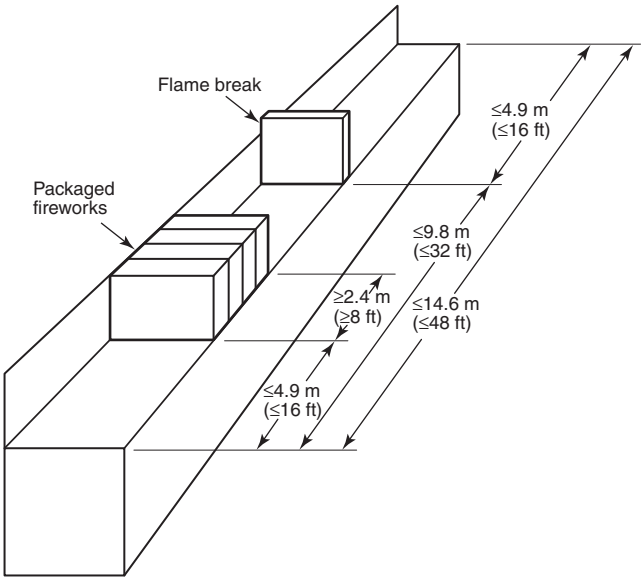

FIGURE A.7.10.3.4 Packaged Fireworks Merchandise and Flame Break Requirements.

be reasonably limited so as not to pose an undue threat to evacuating occupants or to cause rapid spread of the fire to areas remote from the immediate area of the fire. The method and manner of packaging and displaying consumer fireworks have been demonstrated to be effective in accomplishing the intent of this section. The performance criteria may also be met by enclosing consumer fireworks within bins. The packaging material itself can be designed to contain the consumer fireworks. The placement and arrangement of the consumer fireworks within the packages or within bins or on shelves are also important factors. Other containment methods include fastening consumer fireworks together, restraining their movement with packaging materials, or placing consumer fireworks or packages of consumer fireworks within racks, containers, holders, or other structures.

A.7.10.6 This section describes performance criteria for how aerial devices, which are described in C.3.1.2, are to be packaged and displayed and appropriately restrained as needed depending upon the device and the manner in which it is packaged and displayed. Thus, upon ignition by a fire in the retail sales display area containing devices, the resultant effect of the ejection of pyrotechnic components will be reasonably limited so as not to pose an undue threat to evacuating occupants or to cause rapid spread of the fire to areas remote from the immediate area of the fire. The method and manner of packaging and displaying aerial devices have been demonstrated to be effective in accomplishing the intent of this section. This performance criteria could also be met by enclosing consumer fireworks within bins. The packaging material itself can be designed to contain the consumer fireworks. The placement and arrangement of the aerial devices within the packages or within bins or on shelves are also important factors. Other containment methods include fastening aerial devices together, restraining their movement with packaging materials, or placing aerial devices or packages of aerial devices within racks, containers, holders, or other structures.

A.7.10.7 Arrangement of horizontal plywood barriers should be as shown in Figure A.7.10.7.

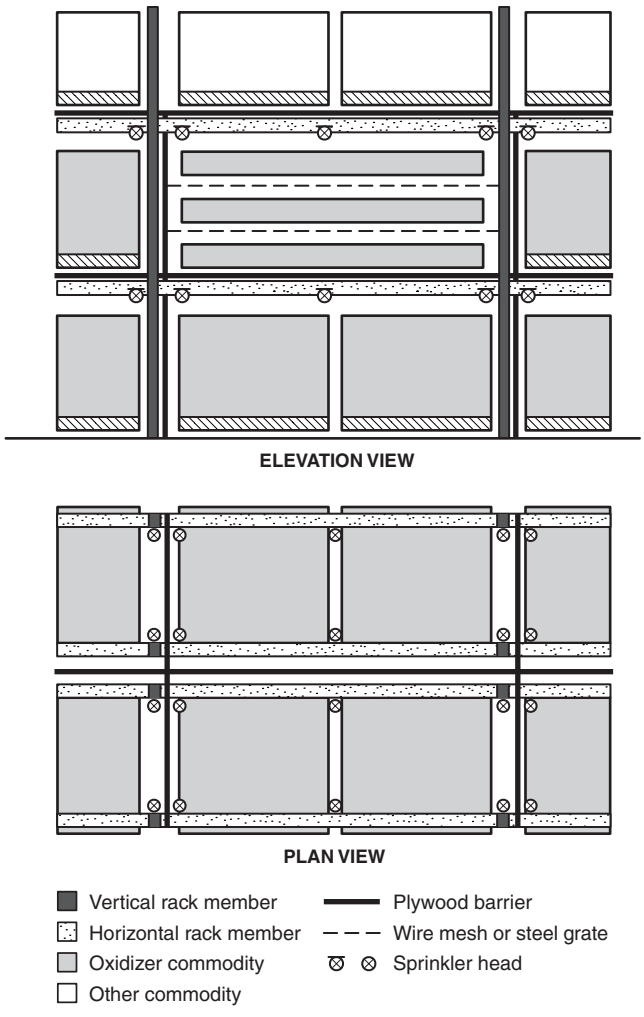

FIGURE A.7.10.7 Arrangement of Horizontal Barrier Separating Combustible Materials and Consumer Fireworks.

A.7.11.3.6 See NFPA 30, *Flammable and Combustible Liquids Code* for the separation distances.

A.7.12.5 Refer to Material Safety Data Sheet (MSDS) for additional information.

A.7.12.6 Training might be required by the U.S. Department of Transportation or the Occupational Safety and Health Administration as appropriate for the purpose of being employed in the operation of a consumer fireworks retail sales or storage facility.

Annex B Magazine Construction

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

B.1 General. Magazines constructed in accordance with the following minimum specifications are approved as bullet resistant. All steel and wood dimensions are actual thickness; concrete block and brick dimensions are nominal.

B.2 Steel Exterior. The steel exterior of a magazine should be constructed of one of the following:

(1) 16-mm (⅝-in.) steel with an interior lining of nonsparking material
(2) 13-mm (½-in.) steel with an interior lining of at least 9.5-mm (⅜-in.) plywood
(3) 9.5-mm (⅜-in.) steel lined with one of the following materials:
  (a) 50.8-mm (2-in.) hardwood
  (b) 76.2-mm (3-in.) softwood
  (c) 57.2-mm (2-in.) plywood
(4) 6.4-mm (¼-in.) steel lined with one of the following materials:
  (a) 76.2-mm (3-in.) hardwood
  (b) 127-mm (5-in.) softwood
  (c) 133.4-mm (5¼-in.) plywood
  (d) 38.1-mm (1½-in.) plywood with an intermediate layer of 50.8-mm (2-in.) of hardwood
(5) 4.8-mm (³⁄₁₆-in.) steel lined with one of the following materials:
  (a) 101.6-mm (4-in.) hardwood
  (b) 177.8-mm (7-in.) softwood
  (c) 171.5-mm (6 ¾-in.) plywood
  (d) 19.1-mm (¾-in.) plywood with an intermediate layer of 76.2-mm (3-in.) of hardwood
(6) 3.2-mm (⅛-in.) steel lined with one of the following materials:
  (a) 127-mm (5-in.) hardwood
  (b) 228.6-mm (9-in.) softwood
  (c) 19.1-mm (¾-in.) plywood with an intermediate layer of 101.6-mm (4-in.) of hardwood
  (d) Two layers of 19.1-mm (¾-in.) plywood with an intermediate layer of 92.1-mm (3⅝-in.), well-tamped, dry sand or sand/cement mixture

B.3 Fire-Resistant Exterior. The exterior of any type of fire-resistant material in a magazine should include one of the following to be considered structurally sound:

(1) Interior lining of 13-mm (½-in.) plywood placed securely against an intermediate 101.6-mm (4-in.) thick layer of solid concrete block, solid brick, or solid concrete
(2) Interior lining of 19-mm (¾-in.) plywood and all of the following:
  (a) A first intermediate layer of 19-mm (¾-in.) plywood
  (b) A second intermediate layer of 92.1-mm (3⅝-in.), well-tamped, dry sand or sand/cement mixture
  (c) A third intermediate layer of 19-mm (¾-in.) plywood
  (d) A fourth intermediate layer of 50.8-mm (2-in.) hardwood or 14-gauge steel
(3) Intermediate 152.4-mm (6-in.) space filled with well-tamped, dry sand or sand/cement mixture

B.4 Masonry Exterior. The masonry exterior of a magazine should be constructed of one of the following:

(1) Standard 203.2-mm (8-in.) concrete block with voids filled with well-tamped, dry sand or sand/cement mixture
(2) Standard 203.2-mm (8-in.) solid brick
(3) Solid concrete of 203.2 mm (8 in.)
(4) Two layers of 101.6-mm (4-in.) concrete block

Annex C Extract from American Pyrotechnics Association Standard 87-1, *Standard for Construction and Approval for Transportation of Fireworks*

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

C.1 Introduction. Paragraphs in this annex that apply to approval by the U.S. Department of Transportation (U.S. DOT) for transportation of fireworks are indicated by a dagger [†] at the end of the appropriate paragraphs.

C.1.1 This annex provides manufacturers, importers, and distributors of fireworks and novelties information to assist them in manufacturing, testing, shipping, and labeling the products of the fireworks industry in accordance with applicable federal laws and current good manufacturing practices. [†]

C.1.2 The information in this annex should enable manufacturers, importers, and distributors of fireworks and novelties to provide their customers with products that can be transported and used safely and without unreasonable risk.

C.1.3 Fireworks and novelties are not acceptable for transportation within the jurisdiction of the United States unless they are classed, packaged, labeled, and marked and are in proper condition for shipment in accordance with the U.S. DOT regulations in 49 CFR. See Section C.5 of this annex for further discussion. [†]

C.1.4 Consumer fireworks (fireworks classed as 1.4G and 1.4S, formerly Common Fireworks) and novelties are not acceptable for sale to the public unless they are manufactured, labeled, and sold in conformance with the regulations of the U.S. Consumer Product Safety Commission (CPSC) published in 16 CFR. See Section C.3 of this annex for further discussion.

(Note that Consumer fireworks are normally classed as 1.4G but can be classed by U.S. DOT as 1.4S on the basis of specific test results.)

C.1.5 United States laws and regulations prescribe mandatory requirements that a person must follow in order to market certain products. In these instances, failure to comply can be regarded by courts as negligence per se in product liability litigation.

C.1.6 This annex applies to fireworks devices and novelties for entertainment purposes. [†]

C.2 Definitions.

C.2.1 Approval. For purposes of this annex, approval means the assignment of proper hazard class, EX number, and proper shipping name by the U.S. DOT so that fireworks and novelties can be transported under conditions specified in 49 CFR. See Section C.5 of this annex for details. [†]

C.2.2 Black Match. A fuse made from thread impregnated with black powder and used for igniting pyrotechnic devices. Black match is classed as 1.3G and described as "Fuse, Instantaneous, non-detonating UN0101" or "Quick match UN0101." [†]

C.2.3 Blowout. The unintended release of a pressure effect from other than the intended orifice of a fireworks device. Examples include expulsion of the bottom plug of a roman candle, expulsion of the clay choke of a fountain, or the rupturing of the wall of a mine or shell. [†]

C.2.4 Burnout. The unintended escape of flame through the wall of a pyrotechnic chamber during functioning of a fireworks device. [†]

C.2.5 Chemical Composition. All pyrotechnic and explosive composition contained in a fireworks device. Inert materials such as clay used for plugs, or organic matter such as rice hulls used for density control, are not considered to be chemical composition. [†]

C.2.5.1 Explosive Composition. Any chemical compound or mixture, the primary purpose of which is to function by explosion, producing an audible effect in a fireworks device. [†]

C.2.5.2 Pyrotechnic Composition. A chemical mixture that on burning and without explosion produces visible or brilliant displays or bright lights, or whistles or motion. [†]

C.2.6 Fireworks. Any device, other than a novelty, intended to produce visible or audible effects, or both, by combustion, deflagration, or detonation. Fireworks are further described as "Fireworks UN0336" or "Fireworks UN0337" (formerly Common Fireworks and now referred to in this document as Consumer Fireworks), "Forbidden Fireworks," or "Fireworks UN0335" (formerly Special Fireworks and now referred to in this document as Display Fireworks). [†]

(Note that propelling and expelling charges consisting of a mixture of sulfur, charcoal, and saltpeter are not considered as designed to produce audible effects.)

C.2.6.1 Consumer Fireworks (formerly Common Fireworks). Any fireworks device for use by the public that complies with the construction, performance, composition, and labeling requirements promulgated by the U.S. Consumer Product Safety Commission (CPSC) in 16 CFR, in addition to any limits and other requirements of this document. See Section C.3 of this annex for details. [†]

C.2.6.2 Display Fireworks (formerly Special Fireworks). Fireworks devices primarily intended for commercial displays that are designed to produce visible or audible effects, or both, by combustion, deflagration, or detonation, including, but not limited to, salutes containing more than 2 grains (130 mg) of explosive composition; aerial shells containing more than 1.4 oz (40 g) of chemical composition exclusive of lift charge; and other exhibition display items that exceed the limits contained in this document for consumer fireworks. Certain devices intended for signaling, illuminating, and incendiary purposes and formerly classed as Special Fireworks no longer fall into this fireworks category. See Section C.4 of this annex for details. [†]

C.2.6.3 Theatrical Pyrotechnics. Pyrotechnic devices for professional use in the entertainment industry similar to consumer fireworks in chemical composition and construction but not intended for consumer use. Such articles meeting the weight limits for consumer fireworks but not labeled as such and containing only chemicals shown in Table C.4.3.1 can be approved under the provisions of this document and classified as "Article, Pyrotechnic, 1.4G, UN0431." [†]

(Note that theatrical pyrotechnics devices can be classed as "Article, Pyrotechnic, 1.4S, UN0432" by U.S. DOT on the basis of specific test results.)

C.2.7 Labeling. A display of written, printed, or graphic matter upon a fireworks device(s) or upon the immediate container of any such device(s), or both. Included are diamond-shaped labels required by U.S. DOT to be displayed on outside packaging for transportation purposes. The term also includes any identification, cautions, and other information required by this document or by any federal government agency. [†]

C.2.8 Marking. The application of the proper shipping name, identification number (UN number), instructions, cautions, weight, or specification mark or combination thereof to a package of hazardous material. Marking also includes any required specification mark on the inside or outside of a shipping container. [†]

C.2.9 Novelty. A device containing small amounts of pyrotechnic or explosive composition, or both, but not described as consumer fireworks. Such devices produce limited visible or audible effects. These items shall be classed as 1.4G, unless classed as 1.4S or deregulated as a hazardous material by U.S. DOT on the basis of specific test results. [†]

C.2.10 Placard. A warning symbol of a square-on-point configuration mounted on each side and each end of a truck, rail car, or freight container that informs the public and emergency personnel of the hazardous nature of the cargo, as specified in 49 CFR, Part 172. [†]

C.2.11 Quick Match (Instantaneous Fuse). Black match that is encased in a loose-fitting paper sheath to make it burn extremely rapidly. Quick match is used for aerial shells and for simultaneous ignition of a number of pyrotechnic devices, such as lances in a ground display piece. Quick match is classed as 1.3G and described as "Fuse, instantaneous, non-detonating" or "Quick match," and assigned identification number "UN0101." [†]

C.2.12 Safety Fuse. A fuse consisting of a thread-wrapped black powder train that has been coated with a water-resistant material. Such fuse is typically 3/32 in. (2.4 mm) in outside diameter and frequently green in color. Safety Fuse is described as "Fuse, Safety UN0105" and classed as 1.4S. [†]

C.3 Requirements for Consumer Fireworks, Novelties, and Theatrical Pyrotechnics. Devices in this category, formerly classed as Class C Explosive, Common Fireworks, are now classed as "Fireworks 1.4G" under the UN system, and referred to in this document as Consumer Fireworks.

Devices intended for non-consumer use in the entertainment industry that meet the chemical composition requirements of this annex can be classed as 1.4G and described as "Article, Pyrotechnic UN0431" under the provisions of this document but are not required to comply with the fuse, construction, and labeling requirements of this annex.

C.3.1 Types of Consumer Fireworks. The following fireworks devices are subject to the requirements of Section C.3 of this annex. [†]

C.3.1.1 Ground and Hand-Held Sparkling and Smoke Devices.

C.3.1.1.1 Cylindrical Fountain. Cylindrical tube containing not more than 2.6 oz (75 g) of pyrotechnic composition. Upon ignition, a shower of colored sparks, and sometimes a whistling effect or smoke, is produced. This device can be provided with a spike for insertion into the ground (Spike Fountain), a wood or plastic base for placing on the ground (Base Fountain), or a wood or cardboard handle to be hand-held (Handle Fountain). Where more than one tube is mounted on a common base, total pyrotechnic composition cannot exceed 7.1 oz (200 g).

C.3.1.1.2 Cone Fountain. Cardboard or heavy paper cone containing not more than 1.8 oz (50 g) of pyrotechnic composition. The effect is the same as that of a cylindrical fountain. Where more than one cone is mounted on a common base, total pyrotechnic composition cannot exceed 7.1 oz (200 g). [†]

C.3.1.1.3 Illuminating Torch. Cylindrical tube containing not more than 3.5 oz (100 g) of pyrotechnic composition that produces a colored flame upon ignition. Can be spike, base, or hand-held. Where more than one tube is mounted on a common base, total pyrotechnic composition cannot exceed 7.1 oz (200 g). [†]

C.3.1.1.4 Wheel. Pyrotechnic device intended to be attached to a post or tree by means of a nail or string. Can have one or more drivers, each of which can contain not more than 2.1 oz (60 g) of pyrotechnic composition. No wheel can contain more than 7.1 oz (200 g) total pyrotechnic composition. Upon ignition, the wheel revolves, producing a shower of color and sparks and, sometimes, a whistling effect. [†]

C.3.1.1.5 Ground Spinner. Small device containing not more than 0.7 oz (20 g) of pyrotechnic composition, venting out an orifice usually on the side of the tube. Similar in operation to a wheel but intended to be placed flat on the ground and ignited. A shower of sparks and color is produced by the rapidly spinning device. [†]

C.3.1.1.6 Flitter Sparkler. Narrow paper tube attached to a stick or wire and filled with not more than 0.2 oz (5 g) of pyrotechnic composition that produces color and sparks upon ignition. The paper at one end of the tube is ignited to make the device function. [†]

C.3.1.1.7 Toy Smoke Device. Small plastic or paper item containing not more than 3.5 oz (100 g) pyrotechnic composition that, upon ignition, produces white or colored smoke as the primary effect. (These devices, where complying with the provisions of this annex, are classed as 1.4G unless classed as 1.4S or not regulated as an explosive by U.S. DOT on the basis of specific test results.) [†]

C.3.1.2 Aerial Devices.

C.3.1.2.1 Sky Rockets and Bottle Rockets. Cylindrical tube containing not more than 0.7 oz (20 g) of chemical composition with a wooden stick attached for guidance and stability. Rockets rise into the air upon ignition. A burst of color or sound, or both, can be produced at or near the height of flight. [†]

C.3.1.2.2 Missile-type Rocket. A device similar to a sky rocket in size, composition, and effect that uses fins rather than a stick for guidance and stability. Missiles shall not contain more than 0.7 oz (20 g) of total chemical composition. [†]

C.3.1.2.3 Helicopter, Aerial Spinner. A tube containing not more than 0.7 oz (20 g) of chemical composition, with a propeller or blade attached. Upon ignition, the rapidly spinning device rises into the air. A visible or audible effect can be produced at or near the height of flight. [†]

C.3.1.2.4 Roman Candle. Heavy paper or cardboard tube containing not more than 0.7 oz (20 g) of chemical composition. Upon ignition, "stars" (pellets of pressed pyrotechnic composition that burn with bright color) are individually expelled. [†]

C.3.1.2.5 Mine, Shell. Heavy cardboard or paper tube usually attached to a wooden or plastic base and containing not more than 1.4 oz (40 g) of chemical composition plus not more than 0.7 oz (20 g) of "lift" charge [the part that actually lifts the aerial effect(s) into the air] per tube. Upon ignition, "stars" (see C.3.1.2.4), components producing reports containing up to 2 grains (130 mg) of explosive composition per report (see C.3.1.3.1), or other devices are propelled into the air. A mine can contain more than one tube, provided the tubes fire in sequence upon ignition of one external fuse. Total chemical composition including lift charges of any multiple tube device cannot exceed 7.1 oz (200 g). [†]

C.3.1.3 Audible Ground Devices.

C.3.1.3.1 Firecracker. Small, paper-wrapped or cardboard tube containing not more than 0.8 grains (50 mg) of explosive composition, except that those used in aerial devices can contain up to 2 grains (130 mg) of explosive composition per report. Upon ignition, noise and a flash of light are produced. [†]

(Note that firecrackers are not subject to the requirements of fuse in C.3.5.1 and chemicals in C.3.6.1 of this annex.)

C.3.1.3.2 Chaser. Paper or cardboard tube venting out the fuse end of the tube containing not more than 0.7 oz (20 g) of chemical composition. The device travels along the ground upon ignition. A whistling effect or other noise is often produced. Explosive composition can be included to produce a report but cannot exceed 0.8 grains (50 mg).

C.3.2 Types of Novelties. The following devices are classed as Fireworks 1.4G and described as Fireworks UN0336 unless they are classed as 1.4S or not regulated as hazardous materials based on specific test results. These devices that are not regulated are not considered to be consumer fireworks. [†]

C.3.2.1 Party Popper. Small plastic or paper item containing not more than 0.25 grains (16 mg) of explosive composition that is friction sensitive. A string protruding from the device is usually pulled to ignite it. This item expels nonflammable paper streamers or other nonflammable novelties, or both, and produces a small report. [†]

C.3.2.2 Snapper. Small, paper-wrapped item containing not more than 0.02 grains (1 mg) of explosive composition coated on small bits of sand, and packaged with sawdust in individual containers of not more than 50 units. When dropped, the device explodes, producing a small report. [†]

C.3.2.3 Snake, Glow Worm. Pressed pellet of not more than 0.07 oz (2 g) of pyrotechnic composition and packaged in retail packages of not more than 25 units that produces as the primary effect a snake-like ash upon burning. The ash expands in length as the pellet burns. (These devices are not regulated for transportation purposes.) [†]

C.3.2.4 Sparkler. Wire or stick coated with pyrotechnic composition, that cannot exceed 3.5 oz (100 g) per item, that pro-

duces a shower of sparks upon ignition. These items cannot contain magnesium, except that magnalium (magnesium-aluminum alloy) is permitted. Items containing any chlorate or perchlorate salts cannot exceed 0.2 oz (5 g) of composition per item. (These items are not regulated as explosives for transportation purposes. However, some meet the criteria for flammable solids.) [†]

C.3.2.5 Toy Caps. Toy plastic or paper caps for toy pistols in sheets, strips, rolls, or individual caps, containing not more than an average of 16 mg (0.25 grains) of explosive composition per cap. Toy caps are described as "Fireworks UN0336" and classed as 1.4G. Toy caps are to be packed in inside packages constructed of cardboard not less than 0.013 in. (0.33 mm) in thickness, metal not less than 0.008 in. (0.2 mm) in thickness, noncombustible plastic not less than 0.015 in. (0.38 mm) in thickness, or a composite blister package consisting of cardboard not less than 0.013 in. (0.33 mm) in thickness, and noncombustible plastic not less than 0.005 in. (0.13 mm) in thickness, which are to provide a complete enclosure. The minimum dimensions of each side or end of such package are to be not less than ⅛ in. (3.2 mm) in height. The number of caps in these inside packages is to be limited so that no more than 10 grains (650 mg) of the explosive composition of toy caps are to be packed in any inside container. These inner containers are to be packed in outside containers meeting the requirements specified in C.5.3.1 of this annex. [†]

C.3.2.6 Other Novelties. Devices intended to produce unique visual or audible effects and containing 0.8 grains (50 mg) or less of explosive composition and limited amounts of other pyrotechnic composition. Examples include cigarette loads, trick matches, explosive auto alarms, and other trick noise makers. [†]

C.3.3 Other Devices. Any device producing unique pyrotechnic or explosive effects or combinations of effects not enumerated in Section C.3 of this annex. [†]

C.3.4 Combination Items. Fireworks devices intended to produce more than one of the effects described in Section C.3 of this annex, and that contain not more than 7.1 oz (200 g) of total chemical composition. [†]

C.3.5 Specific Requirements.

C.3.5.1 Fuse.

C.3.5.1.1 Only safety fuse or other fuse that has been protected to resist side ignition can be used in devices subject to the requirements of this annex.

See APA 87-1, Annex B, for method of measuring resistance to side ignition. Devices, such as ground spinners, that require a restricted orifice for proper functioning and that contain less than 0.2 oz (6 g) of pyrotechnic composition are not subject to the requirements of C.3.5.1.1.

C.3.5.1.2 The fuse needs to be of sufficient length to burn at least 3 seconds but not more than 6 seconds before ignition of the device, except that fuse for roman candles or similar devices requiring a longer fuse for safe functioning can burn up to 12 seconds before ignition of the device.

C.3.5.1.3 The fuse needs to be securely attached, so that it will support either the weight of the device plus 8 oz (227 g) of dead weight or double the weight of the device, whichever is less, without separation from the fireworks device.

C.3.5.2 Construction.

C.3.5.2.1 Bases. Each fireworks device that requires a base needs to utilize a base of wood or plastic (preferably nonbrittle, medium-impact polystyrene). The minimum horizontal dimension or the diameter of the base needs to be equal to at least one-third the height of the device (excluding any protruding fuse), unless the device remains upright when subjected to a tilt of 12 degrees from the horizontal. Bases are to remain firmly attached to the item during transportation, handling, and normal operation.

See APA 87-1, Annex B, for method of measuring.

C.3.5.2.2 Sticks. The stick on a rocket (including skyrockets and bottle rockets), and on other fireworks devices that utilize a stick, is to be firmly attached to the body of the device by means of glue, staples, or wire, and is to be secure enough to remain firmly attached during transportation, handling, and normal operation. Sticks are to be rigid and of such length so as to assure stable flight. The maximum curvature of such stick(s) cannot exceed 1 in. (25 mm).

See APA 87-1, Annex B, for method of testing rigidity.

C.3.5.2.3 Handles. Each fireworks device that is intended to be hand-held and is so marked is to incorporate a handle at least 4 in. (101 mm) in length. Handles are to remain firmly attached during transportation, handling, and normal operation of the device, or are to consist of an integral section of the device extending at least 4 in. (101 mm) below the pyrotechnic chamber, except that sparklers 10 in. (253 mm) or less in length shall have handles at least 3 in. (76 mm) in length.

C.3.5.2.4 Spikes. Spikes that constitute an integral part of a fireworks device are to protrude at least 2 in. (51 mm) from the base of the device and are to have a blunt tip not less than ⅛ in. (3.2 mm) in diameter or ⅛ in. (3.2 mm) square.

C.3.5.2.5 Pyrotechnic Chamber. The pyrotechnic chamber in a fireworks device that functions other than by exploding needs to be of sufficient thickness and rigidity to allow normal functioning of the device without burnout or blowout. The chamber also needs to be constructed and sealed to prevent leakage of the pyrotechnic composition during transportation, handling, and normal operation. [†]

C.3.5.2.6 Wings. Wings on helicopter-type rockets and similar devices need to be securely attached to the body by means of gluing, wiring, or other appropriate means so that they will remain firmly attached during transportation, handling, and normal operation.

C.3.5.2.7 Wheel Devices. Each wheel device needs to be constructed so that the driver(s), motor(s), and axle(s), where needed (i.e., on wheel devices intended to operate in a fixed location), remain securely attached to the device during transportation, handling, and normal operation.

C.3.5.2.8 Aerial Devices. Each device intended to produce a visible or audible effect high in the air needs to be designed to produce the effect at or near the apogee of its flight.

C.3.5.2.9 Smoke Devices. Each smoke device needs to be constructed so that it will neither burst nor produce excessive flame (excluding fuse and small but brief bursts of flame accompanying normal smoke production). Smoke devices cannot contain plastic in direct contact with the pyrotechnic composition, nor can smoke devices resemble, in color and configuration, banned fireworks devices, such as M80 salutes, cherry bombs, or silver salutes.

C.3.6 Prohibited Chemicals and Components.

C.3.6.1 Prohibited Chemicals. Consumer fireworks devices offered or intended for sale to the public cannot contain a chemical enumerated in Table C.3.6.1, except for trace amounts as impurities, and except as specified therein. [†]

[Note that display fireworks and theatrical pyrotechnics (see C.2.6.3) are not subject to the provisions of this annex.]

Table C.3.6.1 Prohibited Chemicals for Consumer Fireworks

Arsenic sulfide, arsenates, or arsenites
Boron
Chlorates, except:
In colored smoke mixtures in which an equal or greater weight of sodium bicarbonate is included
In party poppers
In those small items (such as ground spinners) wherein the total powder content does not exceed 4 g (0.14 oz) of which not greater than 15 percent or 600 mg (9.3 grains) is potassium, sodium, or barium chlorate
In firecrackers
In toy caps
Gallates or gallic acid
Magnesium (magnesium/aluminum alloys, called magnalium, are permitted)
Mercury salts
Phosphorus (red or white), except that red phosphorus is permissible in caps and party poppers
Picrates or picric acid
Thiocyanates
Titanium, except in particle size greater than 100 mesh
Zirconium

C.3.6.2 Prohibited Components. No component of any consumer fireworks device or novelty can, upon functioning, project or disperse any metal, glass, or brittle plastic fragments. [†]

C.3.6.3 Forbidden Explosive Devices. Any explosive device intended for sale to the public that produces an audible effect (other than a whistle) by a charge of more than 2 grains (130 mg) of explosive composition per report. Devices obtained for bona fide pest control purposes in accordance with regulations promulgated by CPSC in 16 CFR, are not forbidden.

For transportation purposes, the term forbidden explosive devices also includes mixtures or devices containing a chlorate and an ammonium salt or an acidic metal salt, devices that contain yellow or white phosphorus, devices that combine an explosive and a detonator or blasting cap, and any device that has not been approved by the U.S. DOT. [†]

C.3.7 Approval. All consumer fireworks (Fireworks UN0336), novelties, and theatrical pyrotechnics offered for transportation in the United States need to be classified and approved for transportation purposes by the DOT, in accordance with the following procedure. [†]

C.3.7.1 Fireworks and novelties containing only mixtures of chemicals specified in Table C.4.3.1 but none of the chemicals prohibited by C.3.6. For each item for which approval is sought, manufacturers need to submit a copy of the Approval Application (see APA 87-1, Annex D) to the U.S. DOT. U.S. DOT can issue an approval for the device as 1.4G based on the information contained in the form or, at its option, can require pyrotechnic laboratory examination by the Bureau of Explosives, Bureau of Mines, or other pyrotechnic laboratory acceptable to U.S. DOT. [†]

C.3.7.2 Consumer fireworks devices and theatrical pyrotechnics containing any chemical not specified in Table C.4.3.1, but none of the chemicals prohibited by C.3.6. For each item for which approval is sought, the manufacturer needs to submit a sample of each device to the Bureau of Explosives, Bureau of Mines, or other pyrotechnic laboratory acceptable to U.S. DOT (such as a recognized competent authority for fireworks manufactured abroad) for examination and thermal stability testing. The manufacturer needs to then submit a fireworks Approval Application (see APA 87-1, Annex D) together with the appropriate pyrotechnic laboratory reports to U.S. DOT. U.S. DOT can then issue approval based on the information contained in the application and accompanying pyrotechnic laboratory reports. [†]

C.3.7.3 Theatrical pyrotechnics containing only mixtures of chemicals specified in Table C.4.3.1. For each item for which approval is sought, manufacturers need to submit a copy of the Approval Application (see APA 87-1, Annex D) to the U.S. DOT. U.S. DOT can issue an approval for the device as 1.4G based on the information contained in the form or, at its option, can require pyrotechnic laboratory examination by the Bureau of Explosives, Bureau of Mines, or other pyrotechnic laboratory acceptable to U.S. DOT. [†]

C.3.7.4 If classification other than as 1.4G is sought, the U.S. DOT approval procedure in 49 CFR, 173.56(b)(1) needs to be followed. This includes obtaining a pyrotechnic laboratory report from the Bureau of Explosives or other pyrotechnic laboratory acceptable to U.S. DOT. [†]

C.3.8 Marking and Labeling. Fireworks intended for consumer sale and use need to be labeled in conformance with the requirements of the Federal Hazardous Substances Act and regulations promulgated thereunder in 16 CFR, Part 1500. All outside packaging containing fireworks must be marked and labeled in conformance with 49 CFR, Part 172. See APA 87-1, Annex C, and Section C.5 of this annex for details and examples. [†]

C.4 Requirements for Display Fireworks Devices. Devices in this category, formerly classed as Class B Explosives, Special Fireworks, are now classed as 1.3G under the UN system and referred to in this annex as Display Fireworks.

C.4.1 Types of Display Fireworks Devices. The following fireworks devices are subject to the requirements of Section C.4 of this annex. [†]

C.4.1.1 Aerial Shell. A cylindrical or spherical cartridge containing chemical composition exceeding 1.4 oz (40 g) in weight or explosive composition exceeding 2 grains (130 mg) per report, and a black powder propelling charge (lift charge). Shells are most commonly 3 in. to 6 in. (76 mm to 152 mm) in diameter and are fired from metal or heavy cardboard tubes. Upon firing, the lift charge is consumed and the cartridge is expelled into the air. A pyrotechnic effect is produced near the apogee of flight.

C.4.1.2 Salute. Paper-wrapped or cardboard tube containing explosive composition in excess of 2 grains (130 mg). Upon ignition, noise and a flash of light are produced. [†]

C.4.1.3 Other Fireworks Devices.

C.4.1.3.1 Where the quantity of explosive or pyrotechnic composition, or both, exceeds the limit for inclusion in the "Fireworks UN0336" category, devices enumerated in C.3.1 are classed as 1.3G and described as "Fireworks UN0335" (formerly described as Special Fireworks, and classed as "Class B Explosives"). This includes multiple tube devices containing more than 7.1 oz (200 g) of total chemical composition. [†]

C.4.1.3.2 Certain devices intended for signaling, illuminating, and incendiary purposes such as railway torpedoes, airplane flares, illuminating projectiles, incendiary and smoke projectiles, and flash cartridges, formerly described as Special Fireworks, no longer fall into the "Fireworks" category under the U.S. DOT regulations effective on October 1, 1991, and are not part of this annex. [†]

C.4.2 Construction of Aerial Shells.

C.4.2.1 Each shell is to be identified only in terms of the inside diameter (and not the circumference) of the mortar in which it can be safely used. [e.g., 3-in. (76-mm) shells are only for use in 3-in. (76-mm) mortars].

C.4.2.2 Each shell needs to be constructed so that the difference between the inside diameter of the mortar in which it can be safely used and the outside diameter of the shell is no less than ⅛ in. (3.2 mm) and no more than ¼ in. (6.4 mm) for shells not exceeding 3 in. (76 mm) or ½ in. (12.7 mm) for shells larger than 3 in. (76 mm).

C.4.2.3 Each shell needs to be marked with the type of shell, the diameter measurement, and the name of the manufacturer or distributor.

C.4.2.4 The length of the internal delay fuse and the amount of lift charge needs to be sized to ensure proper functioning of the shell in its mortar. Quick match fuse, if required, needs to be long enough to allow not less than 6 in. (152 mm) of fuse to protrude from the mortar after the shell is properly inserted.

C.4.2.5 The length of exposed black match on a shell cannot be less than 3 in. (76 mm) and the fuse is not to be folded or doubled back under the safety cap. Also, the time delay between ignition of the tip of the exposed black match and ignition of the lift charge cannot be less than 3 seconds to allow the operator to retreat safely.

C.4.2.6 A safety cap needs to be installed over the exposed end of the fuse. The safety cap needs to be of a different color than that used for the paper of the fuse.

C.4.3 Approval. Prior to being offered for transportation in the United States, all display fireworks ("Fireworks 1.3G") need to be classified and approved by U.S. DOT in accordance with the following procedures. [†]

C.4.3.1 Devices Containing Only Mixtures of Chemicals Specified in Table C.4.3.1. The manufacturer needs to submit a copy of the Approval Application (see APA 87-1, Annex D) to U.S. DOT for any item that has not previously been approved by U.S. DOT. U.S. DOT can issue an approval for the device based on the information contained in the form or, at its option, can require pyrotechnic laboratory examination by the Bureau of Explosives, Bureau of Mines, or other pyrotechnic laboratory acceptable to U.S. DOT. [†]

Table C.4.3.1 Standard Fireworks Chemicals

Chemical	Typical Use
Aluminum	Fuel
Ammonium perchlorate	Oxygen donor
Antimony	Fuel
Antimony sulfide	Fuel
Barium carbonate	Neutralizer
Barium nitrate	Oxygen donor
Barium sulfate	Oxygen donor
Boric acid	Neutralizer
Calcium carbonate	Neutralizer
Calcium sulfate	Oxygen donor
Carbon or charcoal	Fuel
Copper metal	Color agent
Copper oxide	Oxygen donor, color agent
Copper salts (except copper chlorate)	Color agent
Dextrine	Fuel/binder
Hexamethylenenetetramine (hexamine)	Fuel
Iron and iron alloys (e.g., ferro/titanium)	Fuel
Iron oxide	Oxygen donor
Magnalium (magnesium/aluminum)	Fuel
Magnesium (in display fireworks and theatrical pyrotechnics only)	Fuel
Magnesium carbonate	Neutralizer
Magnesium sulfate	Oxygen donor
Nitrocellulose-based lacquers	Binder
Phosphorus, red (only as provided in Table C.3.6.1)	Fuel
Potassium or sodium benzoate	Whistle
Potassium bichromate (potassium dichromate) (not to exceed 5% of formulation)	Oxygen donor
Potassium chlorate (only as provided in Table C.3.6.1)	Oxygen donor
Potassium hydrogen phthalate	Whistle
Potassium nitrate	Oxygen donor
Potassium perchlorate	Oxygen donor
Potassium sulfate	Oxygen donor
Sodium bicarbonate (sodium hydrogen carbonate)	Neutralizer
Sodium nitrate	Oxygen donor
Sodium salicylate	Whistle
Sodium salts (except sodium chlorate)	Color agent
Sodium sulphate	Oxygen donor
Strontium carbonate	Color agent
Strontium nitrate	Oxygen donor
Strontium salts (except strontium chlorate)	Color agent
Strontium sulfate	Oxygen donor
Sulfur	Fuel
Titanium (particle size >100 mesh if 1.4G or 1.4S Fireworks)	Fuel

C.4.3.2 Devices Containing any Chemical not Specified in Table C.4.3.1. For each item for which approval is sought, the manufacturer needs to submit a sample of each pyrotechnic mixture containing any chemical not specified in Table C.4.3.1 to the Bureau of Explosives or other pyrotechnic laboratory acceptable to U.S. DOT for examination. The manufacturer then submits an Approval Application (see APA 87-1, Annex D), together with the appropriate pyrotechnic laboratory reports to U.S. DOT. U.S. DOT can then issue approval based on the information contained in the application and accompanying pyrotechnic laboratory report(s).

Miscellaneous Compounds:

Organic compounds [compounds such as lactose, shellac, red gum, chlorinated paraffin, and polyvinyl chloride, consisting of some combination of carbon with hydrogen, oxygen, or chlorine, or all three; nitrogen can be present if it accounts for less than 10 percent (by weight) of the compound].

[Note that exact chemical identity of each organic compound is to be included when submitting an Approval Application (see APA 87-1, Annex D) to U.S. DOT.] [†]

C.5 Shipping Requirements.

C.5.1 Transportation Regulating Authorities. Transportation of fireworks is regulated by the United States Department of Transportation (U.S. DOT). Some states and municipalities also regulate transportation of fireworks through their jurisdiction, often by incorporation of federal regulations. [†]

C.5.2 Approval. Except for samples prepared in accordance with U.S. DOT regulations, no fireworks device or novelty can be offered for transportation or be transported until it is classed and approved by U.S. DOT, and an approval number (EX number) is issued (49 CFR, Part 173.86). *(See Sections C.3 and C.4 of this annex and APA 87-1, Annex D.) [†]*

C.5.2.1 EX numbers for fireworks contained in a shipping carton need to be marked on the shipping carton or on the shipping paper. [†]

C.5.2.2 Cartons containing more than 5 different fireworks devices need to be marked with at least 5 of the EX numbers covering items in the carton, or the EX numbers need to appear on the shipping paper [49 CFR, Parts 172.320(c) and (d)]. [†]

C.5.3 Packaging. With certain exceptions, "Fireworks UN0335" (formerly Special Fireworks), "Fireworks UN0336" (formerly Common Fireworks) and Novelties, are to be securely packaged in containers complying with U.S. DOT regulations. Gross weight limitation per package is now dictated by the weight marked on the certified packaging. Until October 1, 1996, these materials were packaged in accordance with the regulations in effect on September 31, 1991 (i.e., U.S. DOT 12B boxes). These materials can be offered in accordance with the new package requirements promulgated under Docket No. HM-181 as of January 1, 1991. However, except as noted below, compliance with these new package standards is mandatory as of October 1, 1996. Fireworks packaged prior to October 1, 1991, in packagings that comply with previous U.S. DOT regulations (such as 12B boxes), can be used until October 1, 2001, but only for shipments in domestic commerce and only if the package has not been emptied or refilled on or after October 1, 1991 [49 CFR, Part 171.14(c)]. Articles with match or friction tip ignition are to be packed so that each individual tip is protected against accidental contact or friction (49 CFR, Part 173.108). Loose chemical composition cannot be present in packages in transportation [49 CFR, Part 172.102(c)(108)].

C.5.3.1 Toy Cap Packaging. Until October 1, 1996, toy caps were packaged in accordance with 49 CFR, Part 173.109, in effect on September 31, 1991 [i.e., U.S DOT 12B fiberboard boxes, with gross weight not to exceed 65 lb (30 kg)]. Toy caps are to be packaged in inner containers meeting the requirements specified in C.3.2.5 of this annex. Toy caps must not be packed with other fireworks. [†]

C.5.4 Placards. Unless otherwise provided, each motor vehicle, freight container, and rail car is to bear appropriate placards on each end and each side [49 CFR, Part 172.504 (a)]. Vehicles containing packages of consumer fireworks or novelties that are labeled 1.4G require a "1.4G" or "Explosive 1.4G" placard (use of the word "explosive" is optional) (49 CFR, Part 172.523). Highway and rail shipments of less than 1000 lb (454 kg) gross weight of such fireworks need not bear a placard [49 CFR, Part 172.504(c)]. Vehicles containing display fireworks in any quantity require a "1.3G" or "Explosive 1.3G" placard (the word "explosive" is optional) (49 CFR, Part 173.522). If both 1.4G and 1.3G are present in a shipment, only the "1.3G" placard is required. Until October 1, 1994, transport vehicles and freight containers were placarded with the old placards (i.e., "Class B Explosive" or "Dangerous" placard), and these placards can be used for domestic highway transportation only until October 1, 2001. [†]

C.5.5 Package Marking and Labeling. Each person who offers fireworks for transportation needs to ensure that the package displays the appropriate square-on-point label [49 CFR, Parts 172.400(a) and 172.411]. Consumer fireworks, toy smoke devices, and trick noise makers are either classed as 1.4G, 1.4S, or not regulated for transportation purposes, and display fireworks are classed as 1.3G (49 CFR, Part 172.101). The label needs to be printed or affixed to the surface of the package near the proper shipping name and identification number, which are also required to appear on the package [49 CFR, Part 172.301(a)]. [†]

C.5.6 Shipping Papers. Each person who offers a fireworks device or novelty for transportation needs to describe the item on a shipping paper. The description needs to include the proper shipping name (49 CFR, Part 172.101 Table, Col. 2), the hazard class of the material, the identification number (Col. 4), the packing group (Col. 5), and the total quantity covered by the description [49 CFR, Part 172.202(a)]. Consumer fireworks (common fireworks) would be described as follows: "Fireworks, 1.4G, UN 0336, PG II." Display fireworks (special fireworks) would be described as "Fireworks, 1.3G, UN 0335, PG II." In addition, the shipper needs to certify that the shipment is properly classified, marked, and labeled [49 CFR, Part 172.204(a)]. [†]

(Note that EX numbers also are to appear on shipping papers unless they are marked on each shipping carton.)

C.6 References.

C.6.1 49 CFR, Parts 171 to 180, U.S. Department of Transportation, can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, or as republished by the Bureau of Explosives as "Hazardous Materials Regulations of the Department of Transportation," available from the Association of American Railroads, 50 F Street, NW, Washington, DC 20001. [†]

C.6.2 16 CFR, Parts 1000 to End, Consumer Product Safety Commission, can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Extracts of these regulations pertaining to fireworks can be obtained only from the American Pyrotechnics Association.

Annex D Glossary

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

D.1 General. The following terms are not necessarily inclusive of all the terms used in the pyrotechnic special effects industry.

D.1.1 Alternating Current (AC). An electrical current that reverses direction in a circuit at regular intervals and most frequently supplied from wall outlets or sockets.

D.1.2 Black Match. A fuse made from thread impregnated with black powder and used for igniting pyrotechnic devices.

D.1.3 Blank Cartridge. A cartridge constructed from a cartridge case equipped with a percussion primer and filled with various loads of smokeless powder or other propellant. Weapons using blank cartridges often are used in conjunction with bullet hits.

D.1.4 Bridgewire. A fine wire used to fire pyrotechnic devices that either heats up or explodes when an electric current is applied.

D.1.5 Bullet Effect. An effect intended to simulate a slug from a weapon as it strikes a person or object.

D.1.6 Bullet Hit. A small explosive charge attached to a person's clothing or body, or to an inanimate object, to simulate a slug from a weapon as it strikes a person or object.

D.1.7 Colored Smoke. An aerosol of special dyestuffs of chemical reactants dispersed by pyrotechnic heat or explosion.

D.1.8 Color Pot. A tube containing pyrotechnic materials that produces a colored flame when ignited.

D.1.9 Concussion Flashpowder. Flashpowder intended to be used in a concussion mortar to produce a loud, concussive effect.

D.1.10 Concussion Item. A pyrotechnic item that produces a loud noise and a violent jarring shock for dramatic effect.

D.1.11 Concussion Mortar. A device specifically designed and constructed to produce a loud noise and a violent jarring shock for dramatic effect without producing any damage.

D.1.12 Day Box. A portable magazine used for the immediate storage of pyrotechnics.

D.1.13 Deflagration. A rapid chemical reaction in which the output of heat is sufficient to enable the reaction to continue and accelerate without input of heat from another source. Deflagration is primarily a surface phenomenon, with most reaction products flowing away from the unreacted material along the surface at less than supersonic velocity. The effect of a deflagration under confinement is an explosion. Confinement of the reaction increases pressure, rate of reaction, and temperature and, in some cases, can cause transition into a detonation.

D.1.14 Det Cord. A flexible, plastic-covered detonating cord resembling a clothesline that contains a highly explosive material.

D.1.15 Detonation. An extremely rapid chemical reaction in which the pressure generated is sufficient to cause the formation of a shock wave, which causes the reaction to continue. Detonation is a phenomenon with reaction products flowing in the direction of unreacted materials at supersonic velocity. The effect of a detonation with or without confinement is an explosion.

D.1.16 Detonator. A device containing an initiating or primary explosive that is used for initiating detonation including, but not limited to; electric blasting caps (instantaneous and delay types); blasting caps for use with safety fuses; detonating cord delay connectors; nonelectric caps that use a detonating cord, shock tube, or other replacement for electric legwires; also an explosive or device initiated by a primer and used to initiate another explosive that is less sensitive and larger.

D.1.17 Direct Current (DC). An electrical current that flows in one direction and most frequently supplied by a battery.

D.1.18 Explosion. The rapid production of hot gases at a high pressure as the result of a chemical reaction and the sudden release of the energy to cause strong dynamic stresses in the surroundings. The term usually refers to the effects of a detonation of initiating explosives and high explosives but also applies to the effect of a deflagrating propellant explosive in certain circumstances such as heavy confinement. The term also describes a mechanical phenomenon in which failure of the container results in a sudden release of pressure from within a vessel.

D.1.19 Explosive Special Effect. See *Pyrotechnic Special Effect.*

D.1.20 First Fire. The ignited mixture used with pyrotechnic devices and loaded in direct contact with the main pyrotechnic charge. A pyrotechnic first-fire mixture is compounded to produce a high temperature and hot slag. The mixture is readily ignitible and capable of igniting the underlying pyrotechnic charge.

D.1.21 Flare. A pyrotechnic device designed to produce a single source of intense light for a defined period of time.

D.1.22 Flash Pot. A device used with flashpowder that produces a flash of light and is capable of directing the flash in an upward direction.

D.1.23 Flashpowder. A specific pyrotechnic material in powder form composed of fuel(s) and oxidizer(s). Ignition produces a flash of light, sparkles, an audible report, or a combination of these effects.

D.1.24 Gerb. A cylindrical preload intended to produce a controlled spray of sparks with a reproducible and predictable duration, height, and diameter.

D.1.25 Igniter. An electrical, chemical, or mechanical device normally used to fire pyrotechnics.

D.1.26 Ingredient. A chemical used to create a pyrotechnic material that is not, itself, a pyrotechnic material.

D.1.27 Lift Charge. The composition in a pyrotechnic device that propels (lifts) the effect into the air when ignited. It usually consists of a black powder charge.