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NFPA 1124 Manufacture, Transportation, and Storage of Fireworks 1984

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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

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

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

Statement on NFPA Procedures

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

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Code for the Manufacture, Transportation, and Storage of Fireworks

NFPA 1124-1984

1984 Edition of NFPA 1124

This edition of NFPA 1124, *Code for the Manufacture, Transportation, and Storage of Fireworks*, was prepared by the NFPA Committee on Pyrotechnics, and acted on by the National Fire Protection Association, Inc. at its Annual Meeting held May 21-24, 1984 in New Orleans, Louisiana. It was issued by the Standards Council on June 14, 1984, with an effective date of July 5, 1984, and supersedes all previous editions.

The 1984 edition of this standard has been approved by the American National Standards Institute.

Origin and Development of NFPA 1124

This 1984 edition of NFPA 1124 is 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 to be consistent with the numbering of other documents relating to pyrotechnics.

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 also 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.

Committee on Pyrotechnics

G. Harry Stine, *Chairman*
Phoenix, AZ
Rep. Nat'l Assn. of Rocketry

Robert P. Benedetti, *Secretary*
National Fire Protection Assn.
(Nonvoting)

Dane Boles, Estes Industries
Rep. Hobby Industry Assn. of America-Model Rocketry Div.
Orville H. Carlisle, Norfolk, NB
Dr. John A. Conkling, Washington College
D. O. Crabtree, Hands Fireworks, Inc.
Anthony Fabrizi, NJ Fireworks Mfg. Co.
Rep. American Pyrotechnics Assn.
William H. Hargett, Los Angeles City Fire Dept., CA
Rep. Fire Marshals Assn. of North America
Dennis Hirschfelder, Nat'l Society to Prevent Blindness
Albert E. Hole, Fountain Valley, CA
Ernest E. Juillerat Jr., Northwestern University
Dale C. Miller, Falls Church, VA
Robert A. Powell, Vacaville Fire Dept., CA
Thomas E. Reichelderfer, American Academy of Pediatrics-Committee on Accident Prevention
Victor G. Willis, US Dept. of the Navy
Rep. American Defense Preparedness Assn.

Nonvoting

Paul J. Galvydis, US Consumer Product Safety Commission

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

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

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NFPA 1124-1984

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

Information on referenced publications can be found in Chapter 6 and Appendix C.

Chapter 1 General

1-1 Scope.

1-1.1 This Code shall apply to the manufacture, transportation, and storage of fireworks.

1-1.2 This Code shall not apply to the sale and use of fireworks. (*See NFPA 1121L, Model State Fireworks Law, and NFPA 1123, Standard for Public Display of Fireworks.*)

1-1.3 This Code shall not apply to the storage of fireworks at retail stores, nor to the storage of fireworks at the site of a public fireworks display. (*See NFPA 1123, Standard for Public Display of Fireworks.*)

1-1.4 This Code shall not apply to the transportation of fireworks when such transportation is under the jurisdiction of the U.S. Department of Transportation.

1-1.5 This Code shall not apply to the manufacture, transportation, or storage of model rockets and model rocket motors designed, sold, and used for the purpose of propelling recoverable aero models (*see NFPA 1122, Code for Unmanned Rockets*).

1-1.6 This Code shall not apply to the manufacture, transportation, and storage of fireworks by federal and state military agencies.

1-2 Purpose.

1-2.1 The purpose of this Code is to provide reasonable safety in the manufacture, transportation, and storage of fireworks.

1-2.2 The purpose of this Code is also to supplement existing federal, state, or local regulations.

1-3 Equivalency. This Code is not intended to prevent the use of systems, methods, or devices which provide equivalent protection to the provisions of this Code, providing equivalency can be demonstrated.

1-4 Definitions. For the purpose of this Code, the following terms shall have the meanings given below.

Approved. Acceptable to the "authority having jurisdiction."

NOTE: 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 or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

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

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

Barricade. A natural or artificial barrier that will effectively screen a magazine, building, railway, or highway from the effects of an explosion in a magazine or building containing explosives. To be effective, a barricade must be of such height that a straight line from the top of any sidewall of a magazine or building containing explosives to the eave line of any magazine or building, or to a point 12 ft (3.7 m) above the center of a railway or highway, will pass through the barricade.

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

Natural Barricade. Natural features of the ground, such as hills or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine or building containing explosives when the trees are bare of leaves.

Bullet-Sensitive Explosive Material. Explosive material that can be detonated by 150-grain M2 ball ammunition having a nominal muzzle velocity of 2700 fps (824 mps) when fired from a 0.30 caliber rifle at a distance of 100 ft (30.5 m), measured perpendicular. The test material is at a temperature of 70° to 75°F (21° to 24°C) and is placed against a ¼-in. (12.4-mm) steel plate.

Explosive.* Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion. The 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 "explosives" includes any material determined to be

within the scope of Title 18, *United States Code*, Chapter 40, Importation, Manufacture, Distribution and Storage of Explosive Materials, and also includes any material classified as an explosive by the Hazardous Materials Regulations of the U.S. Department of Transportation.

Fireworks. Any composition or device for the purpose of producing a visible or an audible effect by combustion, deflagration, or detonation, and which meets the definition of "common" or "special" fireworks as set forth in the U.S. Department of Transportation's (DOT) Hazardous Materials Regulations, Title 49, *Code of Federal Regulations*, Parts 173.88 and 173.100.

Exception No. 1: Toy pistols, toy canes, toy guns, or other devices in which paper and/or plastic caps, manufactured in accordance with DOT regulations, Title 49, Code of Federal Regulations, Part 173.100(p), and packed and shipped according to said regulations, are not considered to be fireworks and shall be allowed to be used and sold at all times.*

Exception No. 2: Model rockets and model rocket motors designed, sold, and used for the purpose of propelling recoverable aero models are not considered to be fireworks. (See NFPA 1122, Code for Unmanned Rockets.)

Exception No. 3: Propelling or expelling charges consisting of a mixture of sulfur, charcoal, and saltpeter are not considered as being designed for producing audible effects.

Common Fireworks. Any small firework device designed primarily to produce visible effects by combustion and which must comply with the construction, chemical composition, and labeling regulations of the U.S. Consumer Product Safety Commission, as set forth in Title 16, *Code of Federal Regulations*, Parts 1500 and 1507. Some small devices designed to produce audible effects are included, such as whistling devices, ground devices containing 50 mg or less of explosive composition, and aerial devices containing 130 mg or less of explosive composition. Common fireworks are classified as Class C explosives by the U.S. Department of Transportation (DOT) and include the following:

A. Ground and Hand-Held Sparkling Devices.

(1) *Dipped Stick; Sparkler.* Stick or wire coated with pyrotechnic composition that produces a shower of sparks upon ignition. Total pyrotechnic composition may not exceed 100 g per item. Those devices containing any perchlorate or chlorate salts may not exceed 5 g of pyrotechnic composition per item. Wire sparklers which contain no magnesium and which contain less than 100 g of composition per item are not included in this category, in accordance with DOT regulations.

(2) *Cylindrical Fountain.* Cylindrical tube not more than ¾ in. (19 mm) inside diameter, containing up to 75 g of pyrotechnic composition. Upon ignition, a shower of colored sparks, and sometimes a whistling effect, is produced. This device may 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, if intended to be hand-held (handle fountain).

(3) *Cone Fountain.* Cardboard or heavy paper cone containing up to 50 g of pyrotechnic composition. The effect is the same as that of a cylindrical fountain.

(4) *Illuminating Torch.* Cylindrical tube containing up to 100 g of pyrotechnic composition. Upon ignition, colored fire is produced. May be spike, base, or hand-held.

(5) *Wheel.* Pyrotechnic device attached to a post or tree by means of a nail or string. Each wheel may contain up to 6 "driver" units: tubes not exceeding ½ in. (12.5 mm) inside diameter and containing up to 60 g of pyrotechnic composition. Upon ignition, the wheel revolves, producing a shower of color and sparks and sometimes a whistling effect.

(6) *Ground Spinner.* Small device similar to a wheel in design and effect and placed on the ground and ignited. A shower of sparks and color is produced by the rapidly spinning device.

(7) *Flitter Sparkler.* Narrow paper tube filled with pyrotechnic composition that produces color and sparks upon ignition. This device does not have a fuse for ignition. The paper at one end of the tube is ignited to make the device function.

B. Aerial Devices.

(1) *Sky Rocket.* Tube not exceeding ½ in. (12.5 mm) inside diameter that may contain up to 20 g of pyrotechnic composition. Sky rockets contain a wooden stick for guidance and stability and rise into the air upon ignition. A burst of color or noise or both is produced at the height of flight.

(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.

(3) *Helicopter, Aerial Spinner.* A tube not more than ½ in. (12.5 mm) inside diameter and containing up to 20 g of pyrotechnic composition. A propeller or blade is attached which, upon ignition, lifts the rapidly spinning device into the air. A visible or audible effect is produced at the height of flight.

(4) *Roman Candles.* Heavy paper or cardboard tube not exceeding ⅜ in. (9.5 mm) inside diameter and containing up to 20 g of pyrotechnic composition. Upon ignition, up to 10 "stars" (pellets of pressed pyrotechnic composition that burn with bright color) are individually expelled at several-second intervals.

(5) *Mine, Shell.* Heavy cardboard or paper tube up to 2½ in. (63.5 mm) inside diameter attached to a wood or plastic base and containing up to 40 g of pyrotechnic composition. Upon ignition, "stars" [*see B(4)*], firecrackers [*see C(1)*], or other devices are propelled into the air. The tube remains on the ground.

C. Audible Ground Devices.

(1) *Firecracker, Salute.* Small paper-wrapped or cardboard tube containing not more than 50 mg of pyrotechnic composition. Upon ignition, noise and a flash of light is produced.

(2) *Chaser.* Small paper or cardboard tube that travels along the ground upon ignition. A whistling effect, or other noise, is often produced. The explosive

composition used to create the noise may not exceed 50 mg.

D. Combination Items. Fireworks devices containing combinations of two or more of the effects described in categories A, B, and C.

E. Novelties and Trick Noisemakers.

NOTE: Items listed in this section are not classified as common fireworks by the U.S. Department of Transportation.

(1) *Snake, Glow Worm.* Pressed pellet of pyrotechnic composition that produces a large, snakelike ash upon burning. The ash expands in length as the pellet burns. These devices may not contain mercuric thiocyanate.

(2) *Smoke Device.* Tube or sphere containing pyrotechnic composition that, upon ignition, produces white or colored smoke as the primary effect.

(3) *Wire Sparkler.* Wire coated with pyrotechnic composition that produces a shower of sparks upon ignition. These items may not contain magnesium and must not exceed 100 g of composition per item. Devices containing any chlorate or perchlorate salts may not exceed 5 g of composition per item.

(4) *Trick Noisemaker.* Item that produces a small report intended to surprise the user. These devices include:

(a) Party Popper. Small plastic or paper item containing not more than 16 mg of explosive composition that is friction sensitive. A string protruding from the device is pulled to ignite it, expelling paper streams and producing a small report.

(b) Booby Trap. Small tube with string protruding from both ends, similar to a party popper in design. The ends of the string are pulled to ignite the friction-sensitive composition, producing a small report.

(c) Snapper. Small, paper-wrapped item containing a minute quantity of explosive composition coated on small bits of sand. When dropped, the device explodes, producing a small report.

(d) Trick Match. Kitchen or book match that has been coated with a small quantity of explosive or pyrotechnic composition. Upon ignition of the match, a small report or a shower of sparks is produced.

(e) Cigarette Load. Small wooden peg that has been coated with a small quantity of explosive composition. Upon ignition of a cigarette containing one of the pegs, a small report is produced.

(f) Auto Burglar Alarm. Tube which contains pyrotechnic composition that produces a loud whistle and/or smoke when ignited. A small quantity of explosive, not exceeding 50 mg, may also be used to produce a small report. A squib is used to ignite the device.

Special Fireworks. Large fireworks designed primarily to produce visible or audible effects by combustion, deflagration, or detonation. This term includes, but is not limited to, firecrackers containing more than 2 grains (130 mg) of explosive composition, aerial shells containing more than 40 g of pyrotechnic composition, and other display pieces which exceed the limits for classification as "common fireworks." Special fireworks are classified as Class B explosives by the U.S. Department of Transportation.

Fireworks Plant. All land and buildings thereon used for or in connection with the manufacture or processing of fireworks, including storage buildings used with or in connection with plant operation.

Highway. Any public street or road.

Inhabited Building. A building regularly occupied in whole or in 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 fireworks plant.

Magazine. Any building or structure, other than a manufacturing building, which meets the requirements of Chapter 3.

Manufacture. The preparation of fireworks mixes and the loading and assembly of all fireworks.

Exception: The preparation of pyrotechnic devices for immediate use on-site, by qualified personnel, when such manufacture is otherwise legal.

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

Exception: This definition does not apply to wet sparkler mix preparation.

Motor Vehicle. Any self-propelled vehicle, truck, tractor, semi-trailer, or truck-trailer combination used for the transportation of freight over public highways.

Nonprocess Building. Any office building, warehouse, or other building in a fireworks plant where no fireworks or explosive compositions are processed or stored.

Person. Any individual, firm, co-partnership, corporation, company, association, joint-stock association, and including any trustee, receiver, assignee, or personal representative thereof.

Process Building. Any mixing building; any building in which pyrotechnic or explosive composition is pressed or otherwise prepared for finish and assembly; any finishing or assembly building; any building in which fireworks are prepared for shipment. If a pyrotechnic or explosive composition, while in process, is stored in a process building, the building is still considered a process building.

Public Conveyance. Any railroad car, street car, ferry, cab, bus, airplane, or other vehicle which carries passengers for hire.

Pyrotechnic Composition. A chemical mixture which, upon burning and without explosion, produces visible, brilliant displays, bright lights, or sounds.

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

Screen Barricade. Any barrier that will contain the embers and debris from a fire or deflagration in a process building, thus preventing propagation of fire to other buildings or areas. Such barriers may be constructed of metal roofing, ¼ to ½ in. (6 to 13 mm) mesh screen, or equivalent material. The barrier extends from floor level to a height such that a straight line from the top of any side wall of the donor building to the eave line of any exposed building intercepts the screen at a point not less than 5 ft (1.5 m) from the top of the screen. The top 5 ft (1.5 m) of the screen is inclined towards the donor building at an angle of 30 to 45 degrees.

Squib. A device containing a small quantity of igniting compound in contact with a bridge wire.

Storage Building. Any building, structure, or facility in which Class C fireworks in any state of processing or in which finished Class C fireworks are stored, but in which no processing or manufacturing is actually performed.

Warehouse. Any building or structure used exclusively for the storage of materials which are neither combustible materials nor explosive compositions used to manufacture fireworks.

Chapter 2 Manufacturing Operations

2-1 Basic Requirements.

2-1.1 The manufacture of any fireworks, as defined in Section 1-4, shall be prohibited unless it is authorized by federal license, where required, and is conducted in accordance with this Code.

2-1.2 The authority having jurisdiction may restrict the quantity of fireworks that may be manufactured or stored at any location.

2-2 Permit Requirements.

2-2.1 Any person engaged in the business of importing, manufacturing, or dealing in fireworks shall possess a valid federal license or permit, where required by Title XI, Regulation of Explosives, of the Crime Control Act of 1970 (18 *United States Code*, Chapter 40) and shall comply with all applicable state and local laws and regulations.

2-2.1.1 Copies of all required licenses and permits shall be posted at each fireworks plant.

2-2.1.2 License and permit holders shall take every reasonable precaution to protect licenses and permits from loss, theft, defacement, destruction, or unauthorized duplication. Any such occurrence shall be immediately reported to the issuing authority.

2-2.1.3 Licenses or permits shall not be assigned or transferred.

2-2.2 The issuing authority shall be notified immediately of any change of business address.

2-3 Recordkeeping and Reporting.

2-3.1 License or permit holders shall maintain records of all transactions or operations involving explosive materials and fireworks. Such records shall be kept for five years and shall be made available to the authorities having jurisdiction upon request.

2-3.1.1 An accumulation of invoices, sales slips, delivery tickets or receipts, bills of lading, or similar papers representing individual transactions will satisfy the requirements for record keeping, provided such documents include the signature of the receiver of the explosive materials or fireworks.

2-3.2 The loss, theft, or unlawful removal of explosive materials shall be reported immediately to the appropriate officer of the Bureau of Alcohol, Tobacco, and Firearms, U.S. Dept of the Treasury, and to local law enforcement authorities.

2-4 Applicability. All fireworks plants shall comply with the requirements of this chapter.

Exception: Fireworks plants need not comply with Sections 2-5 and 2-9 if they meet all of the following conditions:

(a) only custom fireworks, not for general sale, are manufactured;

(b) not more than 5 lb (2.3 kg) of explosive composition, of which no more than ½ lb (0.23 kg) may be initiating explosive, is present in any one building at any one time;

(c) all explosive and pyrotechnic compositions are removed to an appropriate storage magazine at the end of each work day.

2-5 Site Security.

2-5.1 The plant shall be completely surrounded by a substantial fence having a minimum height of 6 ft (1.8 m). Only office buildings containing no processing or storage may be located outside this fence.

2-5.2 All openings in the fence shall have suitable gates which shall be kept closed and securely locked at all times when not actually in use.

Exception: The main plant entrance may be left open during regular plant operating hours, provided it is in full view of and under observation by an authorized responsible employee or guard.

2-5.3 Conspicuous signs indicating "WARNING — NO SMOKING — NO TRESPASSING" shall be posted along the fence at intervals not exceeding 50 ft (15.3 m).

2-5.4 Only authorized employees or representatives of federal, state, or local agencies having jurisdiction over the plant shall be allowed in the plant without special permission of the person in charge of the plant.

2-6 Separation Distances.

2-6.1 Process buildings, magazines, and storage buildings shall be separated from inhabited buildings, public highways, and passenger railways according to the distances specified in Table 2-6.1.

Table 2-6.1 Minimum Separation Distances of Processing Buildings, Magazines, and Storage Buildings from Inhabited Buildings, Passenger Railways, and Public Highways.[1]

Net Weight of Fireworks[2]	Distance from Passenger Railways and Public Highways[3,4,5]		Distance from Inhabited Buildings[3,4,5]	
	Class C Fireworks	Class B Fireworks[5]	Class C Fireworks	Class B Fireworks[5]
Lb	Ft	Ft	Ft	Ft
100	25	200	50	200
200	30	200	60	200
400	35	200	70	200
600	40	200	80	208
800	45	200	90	252
1,000	50	200	100	292
2,000	58	230	115	459
3,000	62	296	124	592
4,000	65	352	130	704
5,000	68	400	135	800
6,000	70	441	139	882
8,000	73	509	140	1,018
10,000	75	565	150	1,129
15,000	80	668	159	1,335
20,000	83	745	165	1,490
30,000	87	863	174	1,725
40,000	90	953	180	1,906
50,000	93	1,030	185	2,060
60,000	95	1,095	189	2,190
80,000	98	1,205	195	2,410
100,000	100	1,300	200	2,600
150,000	105	1,488	209	2,975
200,000	108	1,638	215	3,275
250,000	110	1,765	220	3,530

For SI Units: 1 lb = 0.454 kg; 1 ft = 0.305 m.

NOTE 1: This Table does not apply to separation distances at fireworks, manufacturing buildings, magazines for storage of Class B fireworks, and storage buildings for Class C fireworks.

NOTE 2: Net weight is the weight of all pyrotechnic and explosive composition and fuse only.

NOTE 3: See Chapter 1 for definitions of "passenger railways," "public highways" and "inhabited buildings."

NOTE 4: Class B fireworks processing buildings and Class B fireworks magazines, including buildings located on the property of a fireworks plant, shall be separated from passenger railways, public highways, and inhabited buildings by a minimum distance of 200 ft (61 m) except that the separation from hospitals, schools, and bulk storages of flammable liquids or flammable gases shall be by a minimum distance of 500 ft (152.5 m).

NOTE 5: These separation distances shall apply to all Class B fireworks except salutes. The separation distances in Table 2-6.3 shall apply for salutes. When salutes and Class B fireworks are stored in the same magazine, the net weight of salute is applied to Table 2-6.3 and the net weight of Class B fireworks, including the net weight of salutes, is applied to Table 2-6.1. Whichever distance is the greater shall determine the separation distances of the magazine.

NOTE 6: All distances in this Table are to be applied with or without barricades or screen-type barricades.

Table 2-6.2 Minimum Separation Distances at Fireworks Manufacturing Plants

Net Weight Fireworks[1]	Distance of Magazines and Storage Buildings from Process Buildings and Nonprocess Buildings[2,5]		Distance Between Process Buildings and Between Process and Nonprocess Buildings[2]	
	Class C Fireworks[3]	Class B Fireworks[4]	Class C Fireworks[3]	Class B Fireworks[4]
Lb	Ft	Ft	Ft	Ft
100	30	30	37	57
200	30	35	37	69
400	30	44	37	85
600	30	51	37	97
800	30	56	37	105
1,000	30	60	37	112
2,000	30	76	37	172
3,000	35	87	48	222
4,000	38	95	60	264
5,000	42	103	67	300
6,000	45	109	72	331
8,000	50	120	78	382
10,000	54	129	82	423

For SI Units: 1 lb = 0.454 kg; 1 ft = 0.305 m.

NOTE 1: Net weight is the weight of all pyrotechnic and explosive compositions and fuse only.

NOTE 2: For the purposes of applying the separation distances in Table 2-6.2, a process building includes a mixing building, any building in which pyrotechnic or explosive compositions are pressed or otherwise prepared for finishing and assembling, and any finishing and assembling building. A nonprocess building means office buildings, warehouses, and other fireworks plant buildings where no fireworks or explosive compositions are processed or stored.

NOTE 3: Distances apply with or without barricades or screen-type barricades.

NOTE 4: Distances apply only with barricades or screen-type barricades.

NOTE 5: Distances include those between magazines, between storage buildings, between magazines and storage buildings, between magazines or storage buildings from process buildings and nonprocess buildings.

2-6.2 Process buildings shall be separated from other process buildings and from nonprocess buildings by the distances specified in Table 2-6.2. Magazines and storage buildings shall be separated from both process and nonprocess buildings by the distances specified in Table 2-6.2.

2-6.3 Magazines containing black powder or Class B salutes shall be separated from each other and from inhabited buildings, public highways, and passenger railways according to the distances specified in Table 2-6.3.

2-6.4 Magazines containing special fireworks other than Class B salutes or black powder shall be separated from each other and from inhabited buildings, public highways, and passenger railways according to the distances specified in Table 2-6.4.

Table 2-6.3 Minimum Separation Distances of Magazines for Storage of Black Powder or Class B Salutes from Inhabited Buildings, Highways, and Other Magazines for Storage of Black Powder or Class B Salutes.

American Table of Distances for Storage of Explosives as Revised and Approved by the Institute of Makers of Explosives — May, 1983. Distances in feet.

QUANTITY OF EXPLOSIVES		DISTANCES IN FEET							
		Inhabited Buildings		Public Highways Class A to D		Passenger Railways — Public Highways with Traffic Volume of more than 3,000 Vehicles/Day		Separation of Magazines	
Pounds Over	Pounds Not Over	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded
2	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
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

For SI Units: 1 lb = 0.454 kg; 1 ft = 0.305 m.

Notes to American Table of Distances for Storage of Explosives

NOTE 1: "Explosive materials" means explosives, blasting agents, and detonators.

NOTE 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, Bureau of Alcohol, Tobacco, and Firearms, U.S. Department of the Treasury.

NOTE 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 number 8 test blasting cap when unconfined.

NOTE 4: "Detonator" means any device containing a detonating charge that is used for initiating detonation in an explosive; the term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses and detonating-cord delay connectors.

NOTE 5: "Magazine" means any building or structure, other than an explosives manufacturing building, used for the permanent storage of explosive materials.

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

NOTE 7: "Artificial barricade" means an artificial mound or revetted wall of earth of a minimum thickness of 3 ft.

NOTE 8: "Barricaded" means that a building containing explosives is effectually screened from a magazine, building, railway, or highway, either by a natural barricade, or by an artificial barricade of such height that a straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine, or building, or to a point 12 ft above the center of a railway or highway, will pass through such intervening natural or artifical barricade.

NOTE 9: "Inhabited building" means a building regularly occupied in whole or in 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 explosives.

NOTE 10: "Railway" means any steam, electric, or other railroad or railway which carries passengers for hire.

NOTE 11: "Highway" means any street or public road. "Public Highways Class A to D" are highways with average traffic volume of 3,000 or less vehicles per day as specified in "American Civil Engineering Practice" (Abbett, Vol. 1, Table 46, Section 3-74, 1956 Edition, John Wiley and Sons).

NOTE 12: When 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 Magazine," except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives. If any two or more magazines are separated from each other by less than the specified "Separation of Magazines" distances, then such two or more magazines, as a group, must be considered as one magazine and the total quantity of explosives 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 of distances specified from other magazines, inhabited buildings, railways, and highways.

NOTE 13: Storage in excess of 300,000 lb of explosives in one magazine is generally not required for commercial enterprises.

NOTE 14: This Table applies only to the manufacture and permanent storage of commercial explosives. 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.

NOTE 15: All types of blasting caps in strengths through No. 8 cap should be rated at 1½ lb of explosives per 1,000 caps. For strengths higher than No. 8 cap, consult the manufacturer.

NOTE 16: For quantity and distance purposes, detonating cord of 50 to 60 grains per foot should be calculated as equivalent to 9 lb of high explosives per 1,000 ft. Heavier or lighter core loads should be rated proportionately.

Table 2-6.4 Table of Distances for the Storage of Special Fireworks. (From the Table of Distances for the Storage of Low Explosives, Title 27, *Code of Federal Regulations*, Part 181.199.)

Lb (over)	Lb (not over)	Inhabited building distance (ft)	Public railroad and highway distance (ft)	Above-ground magazine (ft)
(1)	(2)	(3)	(4)	(5)
0	1,000	75	75	50
1,000	5,000	115	115	75
5,000	10,000	150	150	100
10,000	20,000	190	190	125
20,000	30,000	215	215	145
30,000	40,000	235	235	155
40,000	50,000	250	250	165
50,000	60,000	260	260	175
60,000	70,000	270	270	185
70,000	80,000	280	280	190
80,000	90,000	295	295	195
90,000	100,000	300	300	200
100,000	200,000	375	375	250
200,000	300,000	450	450	300

For SI Units: 1 lb = 0.454 kg; 1 ft = 0.305 m.

2-7 Building Construction.

2-7.1* At least one wall or the roof of each process building shall be provided with explosion relief, either by suitable "weakwall" construction or by explosion vents.

2-7.2 Process buildings shall be single story and shall have no basements or subfloor areas.

2-7.3 Interior wall and ceiling surfaces shall be smooth, free of cracks and crevices. Interior finish shall be of noncombustible or limited combustible materials. (*See NFPA 220, Standard on Types of Building Construction.*)

2-7.3.1 Wall joints and openings for wiring, plumbing and other utilities shall be sealed to prevent entry of dusts.

2-7.4 Horizontal ledges and surfaces upon which dust may settle and accumulate shall be minimized.

2-7.5* Floors and work surfaces shall not have cracks or crevices in which explosives or pyrotechnic compositions may lodge. Floors and work surfaces in mixing and pressing buildings shall be of conductive materials.

2-8 Means of Egress.

2-8.1 Means of egress in all buildings shall comply with applicable requirements of NFPA *101®*, *Life Safety Code®*.

2-8.2 Means of egress in process buildings shall also comply with the following requirements:

(a) From every point in every undivided floor area of

more than 100 sq ft (9 sq m) there shall be at least two remotely located exits.

(b) Where process buildings are divided into rooms, there shall be at least two means of escape from each room of more than 100 sq ft (9 sq m).

Exception: Toilet rooms need have only one exit, provided they are located away from or suitably shielded from process areas.

(c) Exits shall be so located that every point within the room or undivided floor area is within 25 ft (7.6 m) of an exit. The routes to the exits shall not be obstructed.

(d) Exit doors shall open outward and shall be capable of being pressure-actuated from the inside.

2-9 Heat, Light, and Electrical Equipment.

2-9.1 Stoves, exposed flames, and electric heaters shall be prohibited in any building where fireworks, fireworks components, or flammable liquids are or may be present.

2-9.2 Heating shall be provided by steam, hot water, or indirect hot air radiators, or any other means acceptable to the authority having jurisdiction.

2-9.2.1 Unit heaters located in buildings which contain or may contain explosive or pyrotechnic composition shall be equipped with motors and electrical devices suitable for use in Class II, Group E, Division 1 locations. (*See Article 502 of NFPA 70, National Electrical Code®.*)

2-9.3 All wiring in process buildings shall be in rigid metal conduit or shall be Type MI cable. Wiring, switches, and electrical fixtures shall be suitable for Class II, Group E, Division 1 locations. (*See Article 502 of NFPA 70, National Electrical Code.*)

2-9.3.1 Temporary or loose electrical wiring shall not be used.

2-9.3.2 Portable lighting equipment shall not be used.

Exception: Approved portable lighting equipment may be used during repair operations, provided the area has been cleared of all pyrotechnic or explosive material and all dust or residue has been removed by washing.

2-9.3.3 All presses and other mechanical devices shall be electrically bonded and grounded.

2-9.3.4 A master electrical disconnect shall be provided at the point where the electrical service enters the plant. This master disconnect shall be arranged to disconnect all electrical power to the plant.

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

2-9.4 All artificial lighting shall be electrically powered.

2-10 Maximum Number of Occupants and Maximum Quantity Limitations.

2-10.1* The number of occupants in each process building and in each magazine shall not exceed the number necessary for proper conduct of production operations.

2-10.1.1 The maximum number of occupants permitted in each process building and in each magazine shall be posted in a conspicuous location in each process building or magazine.

2-10.2 No more than 500 lb (227 kg) of pyrotechnic or explosive composition shall be permitted at one time in any mixing building or in any building in which the composition is pressed or otherwise prepared for finishing and assembly.

2-10.3 No more than 500 lb (227 kg) of pyrotechnic or explosive composition shall be permitted at one time in a finishing or an assembly building.

2-11 Fire and Explosion Prevention.

2-11.1 All buildings shall be kept clean, orderly, and free of accumulations of dust or rubbish.

2-11.1.1 Spills of explosive or pyrotechnic composition shall be immediately cleaned up and removed from the building. The spilled material shall be destroyed by immersion in water or by burning in a manner acceptable to the authority having jurisdiction.

2-11.1.2 Rags, combustible scrap, and paper shall be kept separate from waste explosive or pyrotechnic materials. Both shall be kept in approved, marked containers until removed from the building. All such disposal containers shall be removed from buildings on a daily basis and removed from the plant at regular intervals. Waste explosive or pyrotechnic materials shall be destroyed by means explained in 2-11.1.1.

2-11.2 Smoking materials shall not be carried into or in the vicinity of process buildings. Personnel shall deposit all smoking materials at a suitable location in a non-process building immediately upon entering the plant.

2-11.2.1 Smoking shall only be permitted in office buildings or in buildings used exclusively as lunch rooms or rest rooms and in which the presence of explosive or pyrotechnic materials is prohibited.

2-11.2.2 Authorized smoking locations shall be so marked, shall contain suitable receptacles for disposal of smoking materials, and shall be provided with at least one approved portable fire extinguisher suitable for use on Class A fires.

2-11.2.3 Personnel whose clothing may be contaminated with explosive or pyrotechnic composition to a degree that may endanger personnel safety shall not be allowed in smoking locations.

2-11.3 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.

2-11.4 Personnel working at or supervising mixing, pressing, and loading operations shall be provided with

and shall wear cotton clothing and conductive footwear. Other protective clothing, eye protection, and respiratory protection shall be worn as needed.

2-11.4.1 Washing, shower, and change facilities shall be provided for personnel.

2-11.4.2 Work clothing shall be washed frequently to prevent accumulation of explosive or pyrotechnic composition and shall not be worn outside the plant.

2-11.5 Each plant shall have an employee designated as safety officer who shall be responsible for general safety, fire prevention and protection, and employee safety training.

2-11.5.1 The safety officer shall give formal instruction regarding proper methods and procedures, safety requirements, and procedures for handling explosive and pyrotechnic compositions and devices to all employees upon commencing employment and at least annually thereafter.

2-11.6 In areas where sparks may ignite materials, only nonsparking hand tools shall be used.

2-11.7* Oxidizers shall not be stored in the same building with combustible powdered materials such as charcoal, gums, metals, sulfur, or antimony sulfide.

2-12 Fire Protection and Emergency Procedures.

2-12.1 Portable fire extinguishers shall be provided in all buildings according to the requirements of NFPA 10, *Standard for Portable Fire Extinguishers.*

Exception: Extinguishers shall not be located in buildings in which explosive or pyrotechnic mixtures are exposed.

2-12.2 Each plant shall have formal emergency procedures. Such procedures shall include employee instruction and training and shall be applicable to all anticipated emergencies. An emergency warning signal shall be established.

2-12.3 Emergency procedures shall include instruction in the use of portable fire extinguishers and instructions on which fires they may be safely used.

2-12.3.1 Employees shall be instructed to abandon fire fighting efforts if the fire involves or may spread to explosive or pyrotechnic compositions or devices. In such cases, employees shall be instructed to evacuate the building immediately and to alert other plant personnel.

2-13 Testing of Fireworks. Testing of fireworks and fireworks components shall be performed only in an area set aside specifically for that purpose. The test site shall be located at a safe distance from all plant buildings or structures.

Chapter 3 Storage of Special Fireworks and Black Powder

3-1 Basic Requirements.

3-1.1 Special fireworks and black powder shall be stored in magazines meeting the requirements of this chapter. They shall be so stored at all times unless in the process of manufacture, packaging, or being transported.

3-1.1.1 Special fireworks that are bullet-sensitive shall be stored only in a Type 1, 2, or 3 magazine.

3-1.1.2 Special fireworks that are not bullet-sensitive and black powder shall be stored only in a Type 1, 2, 3, or 4 magazine.

3-1.2 Magazines containing special fireworks shall be separated from inhabited buildings, passenger railways, and public highways by the distances specified in Table 2-6.4.

3-1.3 Magazines containing special fireworks shall be separated from other magazines and from plant buildings by barricades or screen barricades and by the distances specified in Table 2-6.2.

3-1.4 Magazines containing black powder shall be separated from inhabited buildings, passenger railways, public highways, and other magazines by the distances specified in Table 2-6.3.

3-2 Magazine Construction — General.

3-2.1 Magazines shall be constructed so as to comply with this chapter or in a manner substantially equivalent to the requirements of this chapter.

3-2.2 The ground around magazines shall be graded so that water drains away from the magazine.

3-2.3 Magazines requiring heat shall be heated by either hot water radiant heating within the magazine building or by indirect warm air heating.

3-2.3.1 Indirect warm air shall be heated by either hot water or low-pressure (15 psig or less) steam coils located outside the magazine building.

3-2.3.2 Magazine heating systems shall meet the following requirements:

(a) 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. The surface temperature of the coils shall not exceed 165°F (76°C).

(b) Heating ducts shall be installed so that the hot air discharge from the ducts is not directed against explosive materials or their containers.

(c) The heating system shall be controlled so that the ambient temperature of the magazine does not exceed 130°F (54°C).

(d) 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.

(e) Any electric motor and any controls for electric heating devices used to heat water or produce steam shall have overload devices and disconnects which comply with NFPA 70, *National Electrical Code*. All electrical switchgear shall be located at least 25 ft (7.6 m) from the magazine.

(f) Any fuel-fired heating source for the hot water or steam shall be separated from the magazine by a distance of not less than 25 ft (7.6 m). The area between the heating unit and the magazine shall be cleared of all combustible materials.

(g) Explosive materials stored in magazines shall be arranged so that uniform circulation of air is assured.

3-2.4 When lighting is necessary within the magazine, electric safety flashlights or electric safety lanterns shall be used.

Exception: As provided for in 3-2.4.1.

3-2.4.1 Electric lighting may be used within a magazine only if the installation meets the following requirements:

(a) Junction boxes containing fuses or circuit breakers and electrical disconnects shall be located at least 25 ft (7.6 m) from the magazine.

(b) Disconnects, fuses, and circuit breakers shall be protected by a voltage surge arrester capable of handling 2500 amperes for 0.1 seconds.

(c) All wiring from switches, both inside and outside the magazine, shall be installed in rigid conduit. Wiring leading into the magazine shall be installed underground.

(d) Conduit and light fixtures inside the magazine shall be protected from physical damage by suitable guards or by location.

(e) Light fixtures shall be suitably enclosed to prevent sparks or hot metal from falling on the floor or onto material stored in the magazine.

(f) Junction boxes located within the magazine shall have no openings and shall be equipped with close-fitting covers.

(g) Magazines containing materials that may release flammable vapors shall have wiring and fixtures which meet the requirements of Article 501 of NFPA 70, *National Electrical Code*.

(h) Lights inside magazines shall not be left on when the magazine is unattended.

3-2.5 There shall be no exposed ferrous metal on the interior of the magazine where it may contact material stored within.

3-2.6 When ventilation is required in the magazine, sufficient ventilation shall be provided to protect the stored materials for the specific area in which the plant is located.

3-2.6.1 Stored materials shall be placed so that they do not interfere with ventilation and so as to prevent contact with masonary walls, any steel, or any other ferrous metal by means of a nonsparking lattice or equivalent lining.

3-3 Magazine Construction — Requirements for Specific Types.

3-3.1 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.

(a) Walls and doors shall be bullet-resistant and may be constructed according to any of the specifications listed in Appendix B.

(b) The roof may be constructed of any type of structurally sound material which is or has been made fire-resistant on the exterior.

(c)* 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, then either the roof or the ceiling shall be of bullet-resistant construction.

(d) The foundation may be of masonry, wood, or metal and shall be completely enclosed except for openings to provide cross ventilation. A wood foundation enclosure shall be covered on the exterior with not less than 26-gage metal.

(e) The floor shall be constructed of wood or other suitable material. Floors constructed of materials that may cause sparks shall be covered with a nonsparking surface or the packages of explosive material shall be packed on pallets of nonsparking material.

(f) Type 1 magazines shall be ventilated to prevent dampness or heating of explosives. Ventilation openings shall be screened to prevent entrance of sparks. Ventilators in side walls shall be offset or shielded. Magazines having foundation and roof ventilators, with the air circulating between side walls and floor and between side walls and ceiling, shall have a wood lattice lining or equivalent means to prevent packages from being stacked against side walls and blocking air circulation. A 2-in. (51-mm) air space shall be provided between side walls and the floor.

(g) Each door of the magazine shall be equipped with one of the following locking systems:

1. two mortise locks;
2. two padlocks in separate hasps and staples;
3. a mortise lock and a padlock;
4. a mortise lock that requires two keys to open;
5. a three-point lock or an equivalent lock that secures the door to the frame at more than one point.

Padlocks shall be steel, shall have at least five tumblers, and shall have at least a $\frac{7}{16}$-in. (11-mm) case-hardened shackle. All padlocks shall be protected by steel hoods installed so as to discourage insertion of bolt cutters. Doors secured by a substantial internal bolt do not require additional locking devices. Hinges and hasps shall be securely fastened to the magazine and all locking hardware shall be secured rigidly and directly to the door frame.

3-3.2 Type 2 Magazine. A Type 2 magazine shall be a portable or mobile structure, such as a box, skid-magazine, trailer, or semi-trailer that is fire-resistant,

theft-resistant, weather-resistant, and ventilated. If used for outdoor storage, Type 2 magazines shall be bullet-resistant.

3-3.2.1 Type 2 Outdoor Magazine.

(a) Walls and roof or ceiling shall be constructed according to the provisions of 3-3.1(a), (b) and (c).

(b) Doors shall be of metal, constructed according to the provisions of 3-3.1 (a) or shall have a metal exterior with an inner door meeting the provisions of 3-3.1(a).

(c) Floors constructed of ferrous metal shall be covered with a nonsparking surface.

(d) A magazine that is top opening shall have a lid that overlaps the sides by at least 1 in. (25.4 mm) when in the closed position.

(e) The magazine shall be supported so that its floor does not directly contact the ground.

(f) Magazines less than 1 cu yd (0.77 m^3) in size shall be securely fastened to a fixed object to prevent theft of the entire magazine.

(g) Hinges, hasps, locks, and locking hardware shall comply with 3-3.1(g).

Exception: Padlocks on vehicular magazines need not be protected by steel hoods.

(h) Whenever a vehicular magazine is left unattended, its wheels shall be removed or its kingpins shall be locked or it shall otherwise be effectively immobilized.

3-3.2.2 Type 2 Indoor Magazines.

(a) The magazine shall have substantial wheels or casters to facilitate removal from the building in case of emergency.

(b) The cover of the magazine shall have substantial strap hinges and a means for locking. The magazine shall be kept locked, except during placement or removal of explosive materials, with a five-tumbler padlock or its equivalent.

(c) The magazine shall be painted red and the top shall bear the words "Explosives — Keep Fire Away" in white letters at least 3 in. (76 mm) high.

(d) Magazines constructed of wood shall have sides, bottoms, and covers or doors of 2-in. (51-mm) hardwood, well-braced at corners. The magazines shall be covered with sheet metal of not less than 26 gage. Nails exposed to the interior of the magazines shall be countersunk.

(e) Magazines constructed of metal shall be of 12-gage sheet metal and shall be lined with a nonsparking material. Edges of metal covers shall overlap the sides by at least 1 in (25.4 mm).

3-3.3 Type 3 Magazine. A Type 3 magazine shall be a portable structure that is fire-resistant, theft-resistant, and weather-resistant.

(a) The magazine shall be equipped with a five-tumbler padlock.

(b) Magazines constructed of wood shall have sides, bottoms, and covers or doors of 4-in. (102-mm) hardwood, well-braced at corners. They shall be covered with sheet metal of not less than 26 gage. Nails exposed to the interior of the magazine shall be countersunk.

(c) Magazines constructed of metal shall meet the requirements of 3-3.2.2(e).

3-3.4 Type 4 Magazine. A Type 4 magazine shall be a permanent, portable, or mobile structure such as a building, igloo, box, semi-trailer or other mobile container that is fire-resistant, theft-resistant, and weather-resistant.

3-3.4.1 Type 4 Outdoor Magazine.

(a) The magazine shall be constructed of masonry, wood covered with sheet metal, fabricated metal, or a combination of these materials. Doors shall be metal or wood covered with metal.

(b) Permanent magazines shall comply with 3-3.1(d), (f), and (g).

(c) Vehicular magazines shall comply with 3-3.2.1(g) and shall be immobilized when unattended, as described in 3-3.2.1(h).

3-3.4.2 Type 4 Indoor Magazine. A Type 4 indoor magazine shall comply with all provisions of 3-3.2.2.

3-4 Storage Within Magazines.

3-4.1 Magazines shall be under the responsibility of a competent person at all times. This person shall be at least 21 years of age and shall be responsible for the enforcement of all safety precautions.

3-4.2 All magazines containing explosives shall be opened and inspected at intervals not exceeding three days to determine whether there has been unauthorized or attempted entry or whether there has been unauthorized removal of the magazines or their contents.

3-4.3 Magazine doors shall be kept locked except during placement or removal of explosive materials or during inspection.

3-4.4 Safety rules covering the operations of magazines shall be posted on the interior side of the magazine door.

3-4.5 When explosive materials are removed from the magazine for use, the oldest stock shall be used first.

3-4.6 Corresponding grades and brands of explosive materials shall be stored together so that brand and grade markings are readily visible. All stock shall be stored so as to be easily counted and checked.

3-4.7 Containers of explosive materials shall be piled in a stable manner, laid flat and with top side up.

3-4.8 Open containers of explosive materials shall be securely closed before being returned to a magazine. No container without a closed lid may be stored in a magazine.

3-4.9 Containers of explosive materials shall not be opened, unpacked, or repacked inside or within 50 ft (15.25 m) of a magazine or in close proximity to other explosives.

Exception: Fiberboard containers may be opened inside or within 50 ft (15.25 m) of a magazine. They shall not, however, be unpacked.

3-4.10 Tools used for opening containers of explosive materials shall be nonsparking.

Exception: Metal slitters may be used for opening fiberboard containers.

3-4.11 Magazines shall be used exclusively for the storage of explosive and pyrotechnic materials. Metal tools other than nonferrous conveyors shall not be stored in magazines. Ferrous metal conveyor stands protected by a coat of paint may be stored within magazines.

3-4.12 Magazine floors shall be regularly swept and kept clean, dry, free of grit, paper, empty packing materials, and rubbish. Brooms and other cleaning utensils shall not have spark-producing metal parts. Sweepings from magazine floors shall be disposed of according to manufacturer's instructions.

3-4.13 When 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.

3-4.14 Before making repairs to the interior of a magazine, all explosive or pyrotechnic material shall be removed and the interior shall be cleaned.

3-4.15 Before making repairs to the exterior of a magazine where there is a possibility of causing sparks or fire, all explosive and pyrotechnic material shall be removed.

3-4.16 Explosive or pyrotechnic material removed from a magazine undergoing repair shall either be placed in another magazine or be placed a safe distance from the magazine, where they shall be properly guarded and protected. Upon completion of the repairs, the materials shall be promptly returned to the magazine.

3-5 Miscellaneous Safety Precautions.

3-5.1 Smoking, matches, open flames, spark-producing devices and firearms shall not be permitted inside of or within 50 ft (15.25 m) of a magazine.

Exception: Firearms carried by authorized guards.

3-5.2 The area around a magazine shall be kept clear of brush, dried vegetation, leaves, and similar combustibles for a distance of at least 25 ft (7.6 m).

3-5.3 Combustible materials shall not be stored within 50 ft (15.25 m) of a magazine.

3-5.4 Property on which are located Type 1 magazines and outdoor magazines of Types 2 and 4 shall be posted with signs reading "Explosives - Keep Off." Such signs shall be located so as to minimize the possibility that a bullet shot at the sign will hit the magazine.

Chapter 4 Storage of Common Fireworks

4-1 Basic Requirements.

4-1.1 Common fireworks shall be stored in buildings meeting the requirements of this chapter. They shall be so stored at all times unless in the process of manufacture, packaging, or being transported.

4-1.2 Storage buildings shall be constructed so as to comply with this chapter or in a manner substantially equivalent to the requirements of this chapter.

4-1.3 Storage buildings containing common fireworks shall be separated from inhabited buildings, passenger railways, and public highways by the distances specified in Table 2-6.1 They shall be separated from other storage buildings, magazines, and fireworks manufacturing buildings by the distances specified in Table 2-6.2.

4-2 Construction of Storage Buildings.

4-2.1 Storage buildings for Class C fireworks may be a building, igloo, box, trailer, semi-trailer, or other mobile facility. They shall be constructed to resist fire from an external source and to be weather-resistant and theft-resistant.

4-2.2 Storage buildings shall be provided with explosion venting. (*See NFPA 68, Guide for Explosion Venting.*)

4-2.3 All openings shall be equipped with a means for locking.

4-2.4 All doors shall open outward and all exits must be clearly marked. Aisles and exit doors shall be kept free of obstructions.

4-2.5 All electrical fixtures shall be dust-ignitionproof. All electrical wiring shall comply with Articles 500 and 502 of NFPA 70, *National Electrical Code*.

4-2.5.1 Wall receptacles shall not be permitted. Light fixtures shall have guards.

4-2.5.2 An electrical disconnect shall be located outside each storage building and shall be arranged to de-energize all electrical power to the building.

4-3 Operations in Storage Buildings.

4-3.1 Storage buildings shall be under the direct supervision of a competent person at all times. This person shall be at least 21 years of age, and shall be responsible for enforcing all safety precautions.

4-3.2 Doors shall be kept locked when the building is not in operation.

4-3.3 Safety rules covering the operation of the building shall be posted.

4-3.4 Common fireworks shall be stored in their original packages, in unopened cases and cartons. All containers shall be stacked neatly and in a stable manner.

Exception: Unpackaged fireworks returned to the storage building by retailers may be stored temporarily in bins until repackaged.

4-3.5 Tools used for opening containers shall be nonsparking.

Exception: Metal slitters may be used for opening fiberboard containers.

4-3.6 Storage buildings shall be kept clean, dry, free of grit, paper, empty used packages and rubbish. Brooms and other cleaning utensils shall not have spark-producing metal parts. Sweepings from magazine floors shall be disposed of properly.

4-3.7 Before making repairs to the interior of a storage building, all fireworks shall be removed and the interior shall be cleaned.

4-3.8 Before making repairs to the exterior of a storage building where there is a possibility of causing sparks or fire, all fireworks shall be removed.

4-3.9 Fireworks removed from a storage building undergoing repair shall be handled according to 3-4.16.

4-3.10 Smoking, matches, open flames, spark-producing devices and firearms shall not be permitted inside of or within 25 ft (7.6 m) of a storage building.

Exception: Firearms carried by authorized guards.

4-3.11 The area ground storage magazines shall be kept clear of brush, dried vegetation, leaves, and similar combustibles for a distance of at least 25 ft (7.6 m).

4-3.12 Smoking shall not be permitted inside of or within 25 ft (7.6 m) of storage buildings. Signs reading "FIREWORKS - NO SMOKING," in letters at least 4 in. (10 cm) high, shall be conspicuously posted.

Chapter 5 Transportation of Fireworks

5-1 Basic Requirements.

5-1.1 Transportation of fireworks shall meet all applicable requirements of the U.S. Department of Transportation.

5-1.2 Transportation of fireworks shall meet the requirements of this chapter, to the extent that they do not conflict with the requirements of the U.S. Department of Transportation.

5-2 Vehicle Inspection. A motor vehicle used to transport fireworks shall be inspected to determine that it is in proper condition by checking the following:

5-2.1 Fire extinguishers shall be fully charged and in working order.

5-2.2 All electrical wiring shall be protected and securely fastened to prevent short circuits and intermittent open circuits.

5-2.3 The chassis, motor, oil pan, and body underside shall be reasonably clean and free of excess oil and grease.

5-2.4 The fuel tank and fuel lines shall be secure and shall have no leaks.

5-2.5 Brakes, lights, horn, windshield wipers, and steering apparatus shall all function properly.

5-2.6 Tires shall be checked for proper inflation and defects.

5-2.7 The vehicle shall be in proper condition in all other respects and shall be acceptable for handling explosives and fireworks.

5-3 Driver Qualifications.

5-3.1 Vehicles shall be driven by and in the charge of a properly licensed driver or a qualified representative of the carrier operating the vehicle who is physically fit, careful, capable, reliable, able to read and write the English language, and not addicted to or under the influence of intoxicants, narcotics, or other dangerous drugs.

5-3.2 The driver or representative shall be at least 21 years of age.

5-4 Vehicle Attendance, Routing, and Parking.

5-4.1 A motor vehicle transporting any quantity of black powder or Class B fireworks shall be attended at all times by the driver or the representative of the operator of the vehicle. This attendant shall be informed of the class of material carried and its inherent dangerous properties. He shall be instructed in the procedures to be followed in order to protect the public from danger.

5-4.1.1 The driver or representative shall be thoroughly familiar with the vehicle and shall be trained, given the necessary means, and authorized to move the vehicle when required.

5-4.1.2 The driver or representative shall be familiar with the provisions of this chapter, local and state traffic regulations, and state and federal regulations governing the transportation of fireworks.

5-4.1.3 For the purpose of this section, a motor vehicle shall be considered "attended" when the driver or other attendant is physically on or in the vehicle, or has the vehicle within his field of vision and can reach it quickly and without interference. "Attended" also means that the driver or other attendant is awake, alert, and not engaged in activities which may divert his attention from the vehicle.

Exception No. 1: Necessary communication with public officers or representatives of the carrier, shipper, or consignee or necessary absence from the vehicle to obtain food or to provide for physical comfort.