

NFPA 1127
Code for
High Power Rocketry
2002 Edition

Copyright © 2002, National Fire Protection Association, All Rights Reserved

This edition of NFPA 1127, *Code for High Power Rocketry*, was prepared by the Technical Committee on Pyrotechnics and acted on by NFPA at its May Association Technical Meeting held May 19–23, 2002, in Minneapolis, MN. It was issued by the Standards Council on July 19, 2002, with an effective date of August 8, 2002, and supersedes all previous editions.

This edition of NFPA 1127 was approved as an American National Standard on July 19, 2002.

Origin and Development of NFPA 1127

Starting in 1978, the technical progress in solid propellant rocket motors, rocket airframe materials, bonding agents, and construction techniques gave rise to a new form of nonprofessional rocketry based on model rocketry but using larger and more powerful commercially made solid propellant rocket motors in larger and heavier rocket airframes. This new activity is called high power rocketry. Flying activities have taken place throughout the United States in locations where the authority having jurisdiction has been permissive of the activity and where the Federal Aviation Administration has granted waivers to Part 101 of the Federal Aviation Administration Regulations. After over two decades of operational experience, safety rules, operational procedures, and other facets of the activity have been worked out and tested. A new organization, the Tripoli Rocketry Association, Inc., has been working with the National Association of Rocketry, with longtime representation on the NFPA Technical Committee on Pyrotechnics. Both organizations have contributed to the development of national standards.

The code contains instructional guidelines and specific standards for the design, construction, limitation of charge and power, and reliability of all high power rocket motors manufactured for sale to users; for the qualification and certification of users; for the design and construction of high power rockets propelled by these motors; and for the conduct of tests, launchings, and other operations involving rockets so that hazards are minimized.

The NFPA Technical Committee on Pyrotechnics believes that a separate NFPA code for
Copyright NFPA

high power rocketry is essential because of significant differences in operations and to prevent confusion of the two activities in the minds of public safety officials. High power rocket activities should be allowed within the specifications of this code to guide our science-minded citizens safely.

The 1998 edition included a completely revised Chapter 3 that incorporated requirements and safety provisions for hybrid motor technology. The committee also created a table of clearance distances to promote fire safety in the vicinity of the launch pad. Chapter 5 was revised to be consistent with federal regulations for the storage of low explosives (high power rocket motors and motor reloading kits).

The 2002 edition of this code presents a reorganized document in order to correlate this code with NFPA 1122, *Code for Model Rocketry*, and NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*. Requirements applicable to high power rocket motor manufacturing, motor testing, and certification have been moved to NFPA 1125. This document has also undergone revision to comply with 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, A Division of Toy Biz & 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 [M]

Rep. American Pyrotechnics Association

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]

Copyright NFPA

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]

Bruce E. Kelly, Orem, UT [U]
Rep. Tripoli Rocketry Association, Inc

John Kitchens, City of Los Angeles Fire Department, CA [E]

Gerald R. Laib, NSWC, Code 950X, MD [SE]

Robert L. Markle, U.S. Coast Guard, DC [E]

Dale C. Miller, Falls Church, VA [SE]

J. Patrick Miller, Hardin-Simmons University, TX [U]
Rep. National Association of Rocketry

David J. Pier, MP Associates, Incorporated, 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, US 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.

John J. Weinbrecht, Virginia Beach Fire Department, VA [E]

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, Jr.)

Felix J. (Phil) Grucci, Fireworks by Grucci, Inc., NY [M]
(Alt. to F. J. Grucci, Jr.)

Paul C. Hans, P. Hans & Company, Inc., AZ [M]
(Alt. to G. C. Rosenfield)

Julie L. Heckman, American Pyrotechnics Association, MD [M]
(Alt. to J. A. Conkling)

Bonnie J. Kosanke, Journal of Pyrotechnics, Inc., CO [SE]
(Alt. to K. L. Kosanke)

Larry Mars, MP Associates, Incorporated, CA [M]
(Alt. to D. J. Pier)

Brennan S. Phillips, US Bureau of Alcohol, Tobacco & Firearms, DC [E]

Copyright NFPA

(Alt. to D. S. Shatzer)

Bill Stine, Quest Aerospace, A Division of Toy Biz, 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, or 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.

NFPA 1127 Code for High Power Rocketry 2002 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates

Copyright NFPA

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 B 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 appropriate technical committee.

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

Chapter 1 Administration

1.1 Scope. (Reserved)

1.2 Purpose.

1.2.1 The purpose of this code shall be to ensure the availability of high power rocket motors and motor components that meet national standards of safety and reliability stated herein to certified users.

1.2.2 The purpose of this code shall be to establish guidelines for reasonably safe operation of high power rockets to protect the user and the public.

1.2.3 The purpose of this code shall be to discourage the following to minimize deaths and injuries:

- (1) Experiments with explosive or highly energetic rocket propellants
- (2) Construction of homemade rocket propulsion motors
- (3) Attempted launches or operation of homemade rocket devices

1.3 Application.

This code shall apply to the design, construction, limitation of propellant mass and power, and reliability of high power rocket motors and motor components produced commercially for sale or for use by a certified user for education, recreation, and sporting competition.

1.3.1 This code also shall apply to the design and construction of high power rockets propelled by the high power rocket motors specified in Section 1.3.

1.3.2 This code shall apply to the conduct of launch operations of high power rockets specified in 1.3.1.

1.3.3 This code shall not apply to the design, construction, production, manufacture, fabrication, maintenance, launch, flight, test, operation, use, or other activity connected with a rocket or rocket motor where carried out or engaged in by the following entities:

- (1) National, state, or local government

- (2) An individual, a firm, a partnership, a joint venture, a corporation, or other business entity engaged as a licensed business in the research, development, production, testing, maintenance, or supply of rockets, rocket motors, rocket propellant chemicals, or rocket components or parts
- (3) College or university

1.3.4 This code shall not apply to the design, construction, fabrication, production, manufacture, maintenance, launch, flight, test, operation, or use of rocket-propelled model aircraft that sustain their mass against the force of gravity by aerodynamic lifting surfaces for the duration of their flight in air but shall apply to high power rocket motors and their components that provide propulsion for such model aircraft.

1.3.5 This code shall not apply to model or toy rockets propelled by pressurized liquid.

1.3.6 This code shall not apply to the following:

- (1) Model rockets as specified in NFPA 1122, *Code for Model Rocketry*
- (2) Fireworks rockets, skyrockets, and rockets with sticks as defined in NFPA 1123, *Code for Fireworks Display*, or NFPA 1126, *Standard for the Use of Pyrotechnics before a Proximate Audience*

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 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.

2.3 Other Publications.

2.3.1 U.S. Government Publications.

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

Title 14, *Code of Federal Regulations*, Chapter 1, Subchapter F, Part 101, Paragraphs 101.1

Copyright NFPA

through 101.25, “Federal Aviation Administration Regulations,” or revisions or amendments thereto.

Title 27, *Code of Federal Regulations*, Part 55, Subpart H, Section 55.1.4.1.

Title 49, *Code of Federal Regulations*, Part 178.

Title 49, *United States Code*, Section 1348, 72 Statute 749, Section 307, “Airspace Control and Facilities.”

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 Area.

3.3.1.1 Launch Site Parking Area. An area designated by the range safety officer for parking spectator vehicles.

3.3.1.2 Launching Area. An area designated by the range safety officer in which high power rockets are placed on a launching device and ignited.

3.3.1.3 Prepping Area. An area designated by the range safety officer where high power rockets and high power rocket motors are prepared for launch.

3.3.1.4 Recovery Area. An area designated by the range safety officer for the recovery of high power rockets.

3.3.1.5 Spectator Area. An area designated by the range safety officer where spectators view a high power rocket launch.

3.3.2 Arm. To render an igniter from a safe (no energy) condition to a ready-to-fire condition.

3.3.3 Certified. Approved or endorsed authoritatively.

3.3.4* Certified Motor. A commercially manufactured rocket motor that has been certified by a recognized testing organization, acceptable to the authority having jurisdiction, to meet the certification requirements set forth in NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*.

3.3.5* Certified User. An individual, a distributor, or a seller who has been tested or otherwise examined by a recognized organization that is acceptable to the authority having jurisdiction and has been found to be qualified to purchase, possess, and use high power rocket motors.

3.3.6 Commercial Manufacturer. Any individual, firm, partnership, joint venture, corporation, or other business entity engaged in research, development, production, preparation, testing, maintenance, or supply of rockets, rocket motors, rocket propellant chemicals, rocket propellant, delay or ejection modules, or rocket components or parts.

3.3.7 Flight Cylinder. A high-pressure container used in a hybrid rocket motor system to contain pressurized liquid or gas.

3.3.7.1 Sealed Flight Cylinder. A flight cylinder used in a hybrid rocket motor system into which the pressurized liquid or gas can be loaded prior to launch and stored for an indefinite period.

3.3.7.2 Vented Flight Cylinder. A flight cylinder used in a hybrid rocket motor system that continuously vents the pressurized liquid or gas to the atmosphere during the motor fill and ignition procedures.

3.3.8 Inhabited Building. Any 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.

3.3.9 Installed Total Impulse. The combined total impulses of all rocket motors installed in a rocket and intended to be ignited during the launch and flight of the rocket.

3.3.10 Launch Site. An area used for high power rocket activities that includes (1) a prepping area(s), (2) a launching area(s), (3) a recovery area(s), (4) a spectator area(s), and

(5) a spectator parking area(s).

3.3.11 Module. A pyrotechnic component of a hybrid or solid propellant reloadable rocket motor in which the chemical composition is loaded into a finished assembly by the manufacturer.

3.3.12 Motor Reloading Kit. A product manufactured by a commercial manufacturer that contains the components and parts used to reload and reuse a reloadable rocket motor casing.

3.3.13 Propellant. The material(s) utilized in a rocket motor that produces thrust by the discharge of a working fluid generated by combustion, decomposition, change of state, or other operation of such material contained within the rocket motor.

3.3.14* Range Safety Officer (RSO). A certified user with overall responsibility for the safety, setup, and launching of all rockets at a high power rocket launch.

3.3.15 Rocket. A device that ascends into the air without use of aerodynamic lifting forces acting against gravity and that is propelled by one or more rocket motors.

3.3.15.1 High Power Rocket. A rocket vehicle that (1) is propelled by one or more high power rocket motors; or (2) is propelled by a combination of model rocket motors having an installed total impulse of more than 320 N-sec (71.9 lb-sec); or (3) is propelled by a combination of model rocket motors having more than a total of 125 g (4.4 oz) of propellant weight; or (4) weighs more than 1500 g (53 oz) with motor(s) installed.

3.3.15.1.1 Complex High Power Rocket. A high power rocket that is multistaged or propelled by two or more rocket motors.

3.3.15.2 Model Rocket. A rocket that (1) weighs more than 1500 g (53 oz) with motors installed; and (2) is propelled by one or more model rocket motors having an installed total impulse of no more than 320 N-sec (71.9 lb-sec); and (3) contains no more than a total of 125 g (4.4 oz) of propellant weight.

3.3.16 Rocket Engine. See 3.3.17, Rocket Motor.

3.3.17 Rocket Motor. A device containing propellant that provides the force or thrust to cause a rocket to move. [1122:3.3]

3.3.17.1 High Power Rocket Motor. A rocket motor that has more than 160 N-sec (36 lb-sec) but no more than 40,960 N-sec (9208 lb-sec) of total impulse, or an average thrust greater than 80 N, or more than 62.5 g (2.2 oz) of propellant, and that otherwise meets the other requirements set forth in NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*.

3.3.17.2 Hybrid Rocket Motor. A rocket motor that utilizes a fuel and an oxidizer in different physical states (solid, liquid, or gaseous).

3.3.17.3 Model Rocket Motor. A rocket motor that has a total impulse of no greater than 160 N-sec (36 lb-sec), an average thrust of no greater than 80 N, a propellant weight of no greater than 62.5 g (2.2 oz), and that otherwise meets the other requirements set forth in NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*.

Copyright NFPA

3.3.17.4 Reloadable Rocket Motor. A rocket motor that has been manufactured so that the user can load, reload, and reuse the pressure-resisting body or casing using the parts and components of a motor reloading kit.

3.3.17.5 Solid-Propellant Rocket Motor. A rocket motor that contains a fuel and an oxidizer in solid form and whose force or thrust is produced by the combustion of the fuel and oxidizer.

3.3.18 Safety Monitor. See 3.3.14, Range Safety Officer.

3.3.19* Skyrockets or Rockets with Sticks. Commercially manufactured fireworks rockets not intended for reuse.

3.3.20 Spectator. A nonparticipant whose primary purpose is to view a rocket launch.

3.3.21 Structural Parts. The load-bearing parts of a rocket.

Chapter 4 Requirements for High Power Rocket Construction and Operation

4.1 Range Safety Officer Requirements and Responsibilities.

4.1.1 The range safety officer shall have knowledge of NFPA 1127, *Code for High Power Rocketry*.

4.1.2 The range safety officer shall possess the technical competency of high power rocketry safety as determined by the authority having jurisdiction.

4.1.3 The range safety officer shall have the authority to intervene and control any safety aspect of a high power rocket launch when, in his or her judgment, a potential or actual danger, accident, or unsafe condition exists.

4.2 User Certification.

Only a certified user shall be permitted to launch a high power rocket.

4.3 Operating Clearances.

High power rockets shall only be launched in compliance with the following:

- (1) This code
- (2) Title 49, *United States Code*, Section 1348, 72 Statute 749, Section 307, "Airspace Control and Facilities," Federal Aviation Act of 1958, from 14 CFR 101, "Federal Aviation Administration Regulations," or later revisions or amendments thereto
- (3) Other applicable federal, state, and local laws, rules, regulations, statutes, and ordinances

4.4 Preflight Inspection.

4.4.1 A high power rocket shall be inspected by the range safety officer to determine whether it meets the provisions of this code.

4.4.2 A high power rocket shall not be launched if the range safety officer determines that it does not meet the provisions of this code.

4.5 High Power Rocket Motors and Motor Components.

4.5.1* Only certified high power rocket motors or motor reloading kits or motor components shall be used in a high power rocket.

4.5.2 A single-use high power rocket motor shall not be dismantled, reloaded, or altered.

4.5.3 The components of a reloadable high power rocket motor shall not be altered.

4.5.4 A high power rocket motor or its components shall not be used in a manner or for a purpose other than that specified by the high power rocket motor manufacturer in the instructions.

4.5.5 Warning and other labels applied on the flight cylinder of a hybrid rocket motor shall not be removed.

4.5.6 Vented flight cylinders of a hybrid rocket motor shall be filled and unloaded at a distance equal to or greater than that shown for their motor class in Table 4.16.4.

4.5.7 A package containing a high power motor reloading kit shall not be opened until the user is ready to install the motor reloading kit parts, including the propellant module(s), in the reloadable high power rocket motor casing.

4.6 Rocket Construction.

A high power rocket shall be constructed to withstand the operating stresses and retain structural integrity under the conditions encountered during flight.

4.7 Rocket Airframe Materials.

A high power rocket intended to be propelled by one or more high power rocket motors shall be constructed using lightweight materials such as paper, wood, rubber, plastic, fiberglass, or, when necessary, ductile metal so that the rocket conforms to the other requirements of this code.

4.8 Stability.

The stability of a high power rocket shall be checked by its user prior to launch.

4.8.1 If requested by the range safety officer, the user shall provide documentation of the location of the center of pressure and the center of gravity of the high power rocket.

4.8.2 If the stability of the rocket cannot be determined, or if the rocket is determined to be unstable, it shall not be launched.

4.9 Weight and Power Limits.

4.9.1 The maximum liftoff weight of a high power rocket shall not exceed one-third ($\frac{1}{3}$) of the certified average thrust of the high power rocket motor(s) intended to be ignited at launch.

4.9.2 A high power rocket shall be launched with any combination of motors having 40,960 N-sec (9208 lb-sec) of total impulse or less.

4.10 Recovery.

4.10.1 A high power rocket shall be launched only if it contains a recovery system that returns all parts of the rocket to the ground intact so it can be launched again.

4.10.2 A high power rocket launched with an installed total impulse greater than 2560 N-sec (576 lb-sec) shall use an electronically actuated recovery system as either a primary or backup deployment method.

4.10.3* The person who prepares the high power rocket for flight shall install only flame-resistant recovery wadding if the design of the rocket necessitates the use of wadding.

4.10.4 No attempt shall be made to catch a high power rocket as it approaches the ground.

4.10.5 No attempt shall be made to retrieve a high power rocket from a power line or other life-threatening area.

4.10.6 If a high power rocket becomes entangled in a power line, the utility company or other appropriate authority shall be notified.

4.11 Payloads.

4.11.1* A high power rocket shall not carry a flammable or explosive payload.

4.11.2 No high power rocket shall be used to launch a vertebrate animal.

4.12 Launching Devices.

4.12.1 A high power rocket shall be launched from a stable device that provides rigid guidance until the rocket has attained a speed that ensures a predictable flight path.

4.12.2 The launching device shall incorporate a jet deflector if necessary to prevent the rocket motor exhaust from impinging directly on flammable materials.

4.12.3 A launching device shall not be used to launch a high power rocket at an angle greater than 20 degrees from vertical.

4.13 Ignition Systems.

4.13.1 A high power rocket shall be launched using an ignition system that is remotely controlled, is electrically operated, and contains a launching switch that returns to the "off" position when released.

4.13.2 The ignition system shall contain a removable safety interlock device in series with the launch switch.

4.13.3 The launch system and igniter combination shall be designed, installed, and operated so that liftoff of the rocket occurs within 3 seconds of actuation of the launch system.

4.13.4 If the rocket is to be propelled by a cluster of rocket motors designed to be ignited simultaneously, the ignition scheme that is used shall have been previously tested or proven capable of igniting all rocket motors intended for launch ignition within 1 second following ignition system activation.

4.13.5 An ignition device shall be installed in a high power rocket motor only at the launcher or within the prepping area.

4.13.6 A high power rocket shall be pointed away from the spectator area and other groups of people during and after installation of the ignition device.

4.13.7 Firing circuits shall not be armed with the rocket in other than a launching position.

4.14* Launch Site.

4.14.1 A high power rocket shall be launched only in an outdoor area where tall trees, power lines, and buildings do not present a hazard.

4.14.2 The dimension of the launch site shall be one of the following:

- (1) Not less than one-half the maximum altitude expected, calculated, or simulated, or as granted by an FAA waiver or the authority having jurisdiction
- (2) As specified in Table 4.14.2

Table 4.14.2 Launch Site Dimensions

Installed Total Impulse [N-sec (lb-sec)]	Equivalent Motor Type	Minimum Site Dimensions			
		m	km	ft	mi
160.01–320.00 (36.01–72.00)	H	457	0.5	1,500	0.3
320.01–640.00 (72.01–144.00)	I	914	1.0	3,000	0.6
640.01–1,280.00 (144.01–288.00)	J	1,609	1.6	5,280	1.0
1,280.01–2,560.00 (288.01–576.00)	K	1,609	1.6	5,280	1.0
2,560.01–5,120.00 (576.01–1151.00)	L	3,219	3.2	10,560	2.0
5,120.01–10,240.00 (1151.01–2302.00)	M	4,828	4.8	15,840	3.0
10,240.01–20,480.00 (2302.01–4604.00)	N	6,437	6.4	21,120	4.0
20,480.01–40,960.00 (4604.01–9208.00)	O	8,047	8.0	26,400	5.0

4.14.2.1 For a circular area, the minimum launch site dimension shall be the diameter in
Copyright NFPA

meters (feet).

4.14.2.2 For a rectangular area, the minimum launch site dimension shall be the shortest side in meters (feet).

4.14.3 The minimum launch site dimension shall be not less than 457 m (1500 ft).

4.14.4 Fire suppression devices and first aid kits shall be located at the launch site during the launch of a high power rocket.

4.15 Launcher Location.

4.15.1 The area that encircles a launch pad shall be cleared of brown grass, dry weeds, and other easy-to-burn materials for a diameter equal to at least that specified in Table 4.15.1.

Table 4.15.1 Launcher Clear Distances

Installed Total Impulse [N-sec (lb-sec)]	Launcher Equivalent Motor Type	Minimum Clear Distance	
		m	ft
160.01–320.00 (36.01–72.00)	H	15	50
320.01–640.00 (72.01–144.00)	I	15	50
640.01–1,280.00 (144.01–288.00)	J	15	50
1,280.01–2,560.00 (288.01–576.00)	K	23	75
2,560.01–5,120.00 (576.01–1151.00)	L	30	100
5,120.01–10,240.00 (1151.01–2302.00)	M	38	125
10,240.01–20,480.00 (2302.01–4604.00)	N	38	125
20,480.01–40,960.00 (4604.01–9208.00)	O	38	125

4.15.2 For a high power rocket using a motor(s) with titanium sponge, the minimum clear distance shall be multiplied by a factor of 1.5.

4.15.3 The high power rocket launch pad clear distance from the following locations shall be permitted to be equal to one-half the launch site dimension or 457 m (1500 ft), whichever is greater:

- (1) A building inhabited without the approval of the authority having jurisdiction and the documented approval of the owner(s) of the inhabited building(s), if the inhabited building(s) is unoccupied during the launch
- (2) A public highway on which traffic flow exceeds 10 vehicles per hour, not including traffic flow related to the launch

4.16 Spectator and Participant Distances.

4.16.1 No person shall be permitted to be at a location that is closer to the launch of a high power rocket than the person launching the rocket and those persons authorized by the range safety officer.

4.16.2 All spectators shall remain within an area determined by the range safety officer.

4.16.3 All spectators shall remain behind the range safety officer and the person launching the rocket.

4.16.4 No person shall be permitted to be at a location that is closer to the launch of a high power rocket than the applicable minimum spectator and participant distance set forth in Table 4.16.4.

Table 4.16.4 Minimum Spectator and Participant Distance (Complex High Power Rocket)

Installed Total Impulse		Equivalent Motor Type	Minimum Spectator and Participant Distance		Minimum Spectator and Participant Distance (Complex Rocket)	
N-sec	lb-sec		m	ft	m	ft
160.00–320.00	36.00–72.00	H	30	100	61	200
320.01–640.00	72.01–144.00	I	30	100	61	200
640.01–1,280.00	144.01–288.00	J	30	100	61	200
1,280.01–2,560.00	288.01–576.00	K	61	200	91	300
2,560.01–5,120.00	576.01–1151.00	L	91	300	152	500
5,120.01–10,240.00	1151.01–2302.00	M	152	500	305	1000
10,240.01–20,480.00	2302.01–4604.00	N	305	1000	457	1500
20,480.01–40,960.00	4604.01–9208.00	O	457	1500	610	2000

4.16.5 Parking area distance shall be equal to at least the spectator and participant distance set forth in Table 4.16.4.

4.17 Launch Operations.

4.17.1 No person shall ignite and launch a high power rocket horizontally, at a target, or so that the rocket's flight path goes into clouds or beyond the boundaries of the launch site.

4.17.2 No person shall launch a high power rocket if the surface wind at the launcher is more than 32 km/h (20 mph).

4.17.3 No person shall operate a high power rocket in a manner that is hazardous to aircraft.

4.18 Launch Control.

4.18.1 A high power rocket shall be launched only with the knowledge, permission, and attention of the range safety officer.

4.18.2 Except for those individuals with mobility restrictions, all persons in the launching, prepping, spectator, and parking areas during a countdown and launch shall stand and face the launcher if requested to do so by the range safety officer.

4.18.3 The launching of a high power rocket shall be preceded by a 5-second countdown that is audible throughout the launching, spectator, and parking areas.

4.18.4 A high power rocket that has misfired shall not be approached until all of the following have occurred:

- (1) The safety interlock has been engaged.
- (2) One (1) minute has passed.
- (3) The range safety officer has given permission for one person to approach the misfired rocket to inspect it.

4.19 Storage of High Power Rocket Motors, Motor Reloading Kits, and Pyrotechnic Modules.

4.19.1 High power rocket motors, motor reloading kits, and pyrotechnic modules shall be stored at least 7.6 m (25 ft) from smoking, open flames, and other sources of heat.

4.19.2 Not more than 23 kg (50 lb) of net propellant weight of high power rocket motors, motor reloading kits, or pyrotechnic modules subject to the storage requirements of 27 CFR 55 shall be stored in a Type 3 or a Type 4 indoor magazine.

4.19.2.1 The indoor magazine shall be painted red, and the top shall bear the following words in white letters at least 76 mm (3 in.) high:

EXPLOSIVES – KEEP FIRE AWAY

4.19.2.2 The indoor magazine shall not be located in residence.

4.19.2.3 The indoor magazine shall be permitted to be located in a detached garage or outbuilding.

4.19.2.4 The indoor magazine shall be permitted to be located in an attached garage in a single-family residence where approved by the authority having jurisdiction and the Bureau of Alcohol, Tobacco, and Firearms.

4.19.2.5 Pyrotechnic high power solid-propellant rocket motors, motor reloading kits, modules, or any other solid-propellant motor products that are exempt under 27 CFR 55 shall be stored in a recloseable, noncombustible container.

4.19.3 Large-quantity storage shall comply with both of the following requirements:

- (1) Quantities greater than 22.7 kg (50 lb) of net propellant weight of high power rocket motors, motor reloading kits, or pyrotechnic modules subject to the storage requirements of 27 CFR 55 shall be stored in a Type 4 or greater outdoor magazine.

- (2) The Type 4 or greater magazine shall meet the distance requirements in Table 4.19.3.

Table 4.19.3 Storage Distances for Low Explosives

Weight Over		Weight Not Over		Distance from Inhabited Building		Distance from Public Railroad and Highway		Distance from Aboveground Magazine	
kg	lb	kg	lb	m	ft	m	ft	m	ft
0	0	454	1,000	23	75	23	75	15	50
454	1,000	2,268	5,000	35	115	35	115	23	75
2,268	5,000	45,360	10,000	46	150	46	150	30	100
4,536	10,000	90,720	20,000	58	190	58	190	38	125
9,072	20,000	13,608	30,000	66	215	66	215	44	145
13,608	30,000	18,144	40,000	72	235	72	235	47	155
18,144	40,000	22,680	50,000	76	250	76	250	50	165
22,680	50,000	27,216	60,000	79	260	79	260	53	175
27,216	60,000	31,751	70,000	82	270	82	270	56	185
31,751	70,000	36,287	80,000	85	280	85	280	58	190
36,287	80,000	40,823	90,000	90	295	90	295	59	195
40,823	90,000	45,360	100,000	91	300	91	300	61	200
45,360	100,000	90,718	200,000	114	375	114	375	76	250
90,718	200,000	136,078	300,000	137	450	137	450	91	300

Source: Table is extracted from 27 CFR 55 (BATF regulations for the storage of explosive materials).

4.19.4 High power rocket motors, motor reloading kits, and pyrotechnic modules shall be stored in accordance with all applicable federal, state, and local laws, rules, regulations, statutes, and ordinances.

4.19.5 A high power rocket motor shall not be stored with an ignition element installed.

Chapter 5 High Power Rocket Motor User Certification

5.1 Sales Only to Certified Users.

A high power rocket motor or motor reloading kit shall be sold to, shipped to, stored by, and used only by certified users.

5.2 User Permit Requirements.

Where required by 27 CFR 55, a “User of Low Explosives Permit” shall be obtained prior to both of the following:

- (1) Acquisition by a certified user of a high power solid-propellant rocket motor(s) or motor reloading kit(s) in a state other than that in which the user resides
- (2) Transportation by a certified user of a high power solid-propellant rocket motor(s) or motor reloading kit(s) to a state other than that in which the user resides

5.3 Maintenance of Sales Records.

5.3.1 High power rocket motor manufacturers, distributors, and sellers shall maintain a list of those certified users to whom they have sold high power rocket motors or motor reloading kits that includes the following information:

- (1) Name and address of the purchaser
- (2) Name and address of the national user organization that has certified the user
- (3) Type and number of high power solid-propellant rocket motors or motor reloading kits sold to the certified user
- (4) Date of sale and shipment of high power rocket motors or motor reloading kits to the certified user

5.3.2 The manufacturer, distributor, or seller shall make available, on request, the records specified in 5.3.1 to any law enforcement person or the authority having jurisdiction.

5.3.3 The records specified in 5.3.1 shall be kept for 5 years from the date of sale.

5.4 User Certification Provisions.

5.4.1 Certification of a user shall require both of the following:

- (1) Proof that the user is at least 18 years old
- (2) Proof that the user possesses a level of knowledge and competence in handling, storing, and using a high power solid-propellant rocket motor and high power rockets that is acceptable to the certifying organization

5.4.2 The certifying organization shall maintain a list of all persons it has certified as high power rocket motor users.

5.4.2.1 The list of certified users shall be updated not less than once every 30 days.

5.4.2.2 Upon request and receipt of applicable fees, if any, confirmation of an active member's user certification shall be provided to the following:

- (1) Law enforcement official or authority having jurisdiction

- (2) Manufacturer of high power rocket motors and motor reload kits
- (3) Retailer licensed to sell, distribute, or offer for sale high power rocket motors and motor reloading kits

Chapter 6 Prohibited Activities

6.1 Prohibited Acts.

The following activities shall be prohibited by this code:

- (1) Use of a high power rocket motor for the primary purpose of producing a spectacular display of color, light, sound, or any combination thereof, other than the addition of chemical additives to the propellant for the purpose of producing brightly colored exhaust plume, spark, or smoke effects
- (2) Use of a high power rocket or high power rocket motor as a weapon or against a target
- (3) Tampering with or using a high power rocket motor, motor reloading kit, or module in a manner or to an extent that is contrary to the purpose for which the high power rocket motor or motor reloading kit is designed and intended to be used
- (4) Selling, offering for sale, exposing for sale, or making available a rocket motor or motor reloading kit that does not comply with the requirements of this code and that has not been certified in accordance with NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*
- (5) Making, operating, launching, flying, testing, activating, discharging, or otherwise experimenting with high power rocket motors, motor reloading kits, or pyrotechnic modules that have not been certified in accordance with NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*, other than for the purpose of evaluation of new high power rocket motor technology by a recognized national user organization or an authority having jurisdiction, provided that all other requirements of this code are met and all activities are in accordance with applicable laws, regulations, and ordinances.
- (6) Selling, offering for sale, exposing for sale, purchasing, making, or using fuses, wicks, or other ignition devices intended to be activated by a handheld flame for the purpose of starting or igniting a high power rocket motor
- (7) Affixing to a high power rocket motor or motor reloading kit a statement of compliance with the regulations or a statement of certification required by NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors*, or statements in writing in advertising or on the package that certification according to NFPA 1125 has been obtained, where such certification has not been obtained, has been withdrawn, or has been denied
- (8) Reloading or reusing of any expendable, disposable, solid- or hybrid-propellant high

power rocket motor with any material once the motor has been operated, or reloading of any reloadable, solid- or hybrid-propellant high power rocket motor with any material or by any means not specifically certified

- (9) Selling or transfer of a high power rocket motor or motor reloading kit to any person who is not a certified user, other than the transfer of a single high power rocket motor or motor reloading kit for the purpose of user certification
- (10) Possession, storage, or use of a high power rocket motor or motor reloading kit by any person who is not a certified user, other than the possession, storage, or use of a single high power rocket motor or motor reloading kit for the purpose of user certification
- (11) Participation by persons in prepping or launching of high power rockets, including spectators in the prepping areas, who have consumed alcohol, narcotics, medication, or drugs that could affect judgment, movement, or stability
- (12) Transportation of high power rocket motors, motor reloading kits, or modules in a manner contrary to the regulations of 49 CFR, Part 178, U.S. Department of Transportation

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 evaluation; 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.3.3.4 Certified Motor. Recognized testing organizations that certify high power rocket motors include, but are not limited to, Tripoli Rocketry Association, Inc., the National Association of Rocketry, and their successor organizations.

A.3.3.5 Certified User. A certified user includes, but is not limited to, an individual who has licenses or certificates from Tripoli Rocketry Association, Inc., the National Association of Rocketry, or their successor organizations.

A.3.3.14 Range Safety Officer (RSO). At a high power rocket launch with only one certified user, the certified user also acts as the range safety officer.

A.3.3.19 Skyrockets or Rockets with Sticks. Such fireworks rockets are classified as Class 1.3G or 1.4G explosives in accordance with 49 CFR U.S. Department of Transportation regulations.

A.4.5.1 For a list of commercially manufactured, certified high power rocket motors or motor reloading kits or motor components, the person can check with the authority having jurisdiction. In some instances, the authority having jurisdiction utilizes lists maintained by the Tripoli Rocketry Association and the National Association of Rocketry or their successor organization(s).

A.4.10.3 It is recommended that disposable recovery wadding be biodegradable to address environmental concerns.

A.4.11.1 The requirement of 4.11.1 is not intended to include ejection or staging devices required for the proper operation of the high power rocket.

A.4.14 First-aid facilities or medical help suitable to the number of participants and spectators at the launch site and the maximum size, weight, and power of the rockets operated should be made available.

Annex B Informational References

B.1 Referenced Publications.

The following documents or portions thereof are referenced within this code for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

B.1.1 NFPA Publications. (Reserved)

B.1.2 Other Publications.

B.1.2.1 NAR Publication. National Association of Rocketry, P.O. Box 177, 1311 Edgewood Drive, Altoona, WI 54720 (www.nar.org).

List of Certified High-Power Rocket Motors.

B.1.2.2 TRA Publication. Tripoli Rocketry Association, P.O. Box 970010, Orem, UT 84097 (www.tripoli.org).

List of Certified High-Power Rocket Motors.

B.1.2.3 U.S. Government Publication. U.S. Government Printing Office, Washington, DC 20402.

Title 49, *Code of Federal Regulations*.

B.2 Informational References. (Reserved)

B.3 References for Extracts.

The following documents are listed here to provide reference information, including title and edition, for extracts given throughout this code as indicated by a reference in brackets [] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

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

[Click here to view and/or print an Adobe® Acrobat® version of the index for this document](#)