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1127

Code for High Power Rocketry

2018

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NFPA® 1127

Code for

High Power Rocketry

2018 Edition

This edition of NFPA 1127, *Code for High Power Rocketry*, was prepared by the Technical Committee on Pyrotechnics. It was issued by the Standards Council on October 10, 2016, with an effective date of October 30, 2016, and supersedes all previous editions.

This edition of NFPA 1127 was approved as an American National Standard on October 30, 2016.

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 has given 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 was called high power rocketry. Flying activities now take place throughout the United States in locations where the authority having jurisdiction permits the activity and where the Federal Aviation Administration (FAA) grants waivers to Part 101 of the "Federal Aviation Administration Regulations." After more than two decades of operational experience, safety rules, operational procedures, and other facets of the activity have been worked out and tested. Since 1986, the Tripoli Rocketry Association, Inc., has worked 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.

NFPA 1127 contains instructional guidelines and specific requirements 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 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 requirements of this code so that science-minded citizens can enjoy the activity 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 presented 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 were moved to NFPA 1125. The document was also revised to comply with NFPA style.

The 2008 edition presented amendments based upon findings outlined in a study by the National Association of Rocketry on the safety of sport rocketry. The revisions addressed improvements to rocket recovery, launch guidance devices, launch site specifications, and spectator clearance distances. The National Association of Model Rocketry's *High Power Rocket Safety Code* was added as an annex. The Committee also revised definitions to comply with the NFPA Glossary of Terms.

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The 2013 edition updated federal regulation citations and references, and editorial corrections were made to Table 4.15.1 and Table 4.16.3. The definitions of *rockets* and *rocket motors* were modified to be consistent with changes made to definitions in NFPA 1125, Code for the *Manufacture of Model Rocket and High Power Rocket Motors*. Limitations were placed on arming of firing systems, to ensure safety before placement and after removal of rockets from launch pads. Limitations also were placed on personnel permitted to be at the launch pad during firing. Separation distances were established for simultaneous launches of multiple high power rockets. Criteria were provided to guide alterations to reloadable high power rockets motors in order to maintain motor certification. The code also clarified the type of storage magazine required for storage of rocket motors, motor reloading kits, and pyrotechnic modules.

The 2018 edition allows for the installation of an ignition device into a vented hybrid rocket motor at any time, recognizing that there is no hazard until the vented hybrid rocket motors are filled with oxidizer and that this type of motor has been certified for some time.

The 2018 edition also contains an update in Annex B to the National Association of Rocketry's *High Power Model Rocket Safety Code* to the current 2012 edition.

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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 documents on 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. This Committee does not have responsibility for documents on the retail sales and associated storage of consumer fireworks nor on the use of consumer fireworks by the general public; on the use of pyrotechnic special effects before a proximate audience; nor on the manufacture, transportation, storage for use of military, automotive, agricultural, and industrial pyrotechnics.

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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, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex D. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope. (Reserved)

1.2 Purpose.

1.2.1 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.

1.2.2 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 rocket 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
(2) Fireworks rockets, skyrockets, and rockets with sticks as defined in NFPA 1123 or NFPA 1126

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

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this code and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1122, *Code for Model Rocketry,* 2018 edition.

NFPA 1123, *Code for Fireworks Display,* 2014 edition.

NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors,* 2017 edition.

NFPA 1126, *Standard for the Use of Pyrotechnics Before a Proximate Audience,* 2016 edition.

2.3 Other Publications.

2.3.1 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 14, Code of Federal Regulations, Chapter 1, Subchapter F, Part 101, Subparts A and C, "Federal Aviation Administration Regulations," or revisions or amendments thereto.

Title 27, Code of Federal Regulations, Chapter II, Subchapter C, Part 555, Paragraphs 555.1–555.224, "Commerce in Explosives."

Title 49, Code of Federal Regulations, Part 178, "Specifications for Packagings."

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

2.3.2 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 495, *Explosive Materials Code,* 2013 edition.
NFPA 1122, *Code for Model Rocketry,* 2018 edition.
NFPA 1125, *Code for the Manufacture of Model Rocket and High Power Rocket Motors,* 2017 edition.

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 defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or 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 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.

3.3.4* 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.

3.3.5 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.

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

3.3.6.1 ***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.

3.3.6.2 ***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.

3.3.7* Inhabited Building. A building regularly occupied in whole or part as a habitation for human beings, or any church, schoolhouse, railroad station, store, or other structure where people are accustomed to assemble, but not including any building or structure occupied in connection with the manufacture, transportation, storage, or use of explosive materials. [**495,** 2013]

3.3.8 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.

3.3.9 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).

3.3.10 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.

3.3.11 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.

3.3.12* 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.

3.3.13 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.

3.3.13.1 ***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.

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

3.3.13.2 ***Model Rocket.*** A rocket that (1) weighs no 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. [**1122,** 2018]

3.3.14 Rocket Engine. See 3.3.15, Rocket Motor.

3.3.15 Rocket Motor. A device containing propellant that provides the force or thrust to cause a rocket to move. [**1122,** 2018]

3.3.15.1 ***High Power Rocket Motor.*** A rocket motor that has no more than 40,960 N-sec (9209 lb-sec) of total impulse, and that does not otherwise meet all the requirements for a model rocket motor set forth in NFPA 1125. [**1125,** 2017]

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

3.3.15.3 ***Model Rocket Motor.*** A solid propellant 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 (18 lbf), and that otherwise meets the other requirements set forth in NFPA 1125. [**1125,** 2017]

3.3.15.4 ***Reloadable Rocket Motor.*** A rocket motor that has been designed and manufactured so that the user can load, reload, and reuse the pressure-containing body or casing using the parts and components of a motor-reloading kit. [**1125,** 2017]

3.3.15.5 ***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.

3.3.16 Rocket 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.

3.3.17 Safety Monitor. See 3.3.12, Range Safety Officer (RSO).

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

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

Chapter 4 Requirements for High Power Rocket Construction and Operation

4.1 Range Safety Officer (RSO) Requirements and Responsibilities.

4.1.1 The RSO shall have knowledge of NFPA 1127.

4.1.2 The RSO shall possess the technical competency of high power rocketry safety as determined by the AHJ.

4.1.3 The RSO 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.

4.1.4 The RSO shall be permitted to delegate authority described in this code to other persons meeting the requirements of 4.1.1 and 4.1.2.

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) 49 USC 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 RSO to determine whether it meets the provisions of this code.

4.4.2 A high power rocket shall not be launched if the RSO 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 A reloadable high power rocket motor shall not be altered except as allowed by the manufacturer.

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 4.16.3.

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 rocket 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 RSO, 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 (⅓) 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 (9209 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 is designed to return all parts of the rocket to the ground intact and at a landing speed at which the rocket does not present a hazard.

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.

4.12.1.1* When the wind at launch exceeds 5 mph, the launch guidance device shall be of a length to ensure that the rocket reaches a safe speed before its departure from the device.

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 and Electronic Systems Controlling On-Board Pyrotechnic Components.

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.

4.13.5.1 An ignition device shall be permitted to be installed into a vented hybrid rocket motor at any time.

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 The function of firing circuits and onboard energetics shall be inhibited until the high power rocket is in the launching position.

4.13.8 The function of firing circuits and onboard energetics shall be inhibited prior to removing the high power rocket from the 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, buildings, and persons not involved in the rocket launch do not present a hazard.

4.14.2 The minimum dimensions of the launch site shall be the greater 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 AHJ
(2) 457 m (1500 ft) or twice the minimum spectator and participant distance specified in Table 4.16.3, whichever is greater, for any rocket that is flown
(3) For high power rockets containing motors with a combined total impulse of less than 160 N-sec (36 lb-sec), a total liftoff weight of less than 1500 g (53 oz) and a maximum expected altitude of less than 610 m (2000 ft), the minimum dimension of the launch site shall be permitted to be 305 m (1000 ft).

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

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, and the area shall be cleared of all combustible material.

4.15.3 The high power rocket launching area shall be located at least 457 m (1500 ft) or the minimum spectator and participant distance for the largest high power rocket permitted to be flown, whichever is greater, from the following locations:

(1) An occupied building
(2) A public highway on which traffic flow exceeds 10 vehicles per hour, not including traffic flow related to the launch

4.15.4 The high power rocket launching area shall be located no closer to any boundary of the launch site than the minimum spectator and participant distance specified in Table 4.16.3 for the largest high power rocket to be flown.

4.16 Spectator and Participant Distances.

4.16.1* All spectators shall remain within an area determined to be safe by the RSO, with respect to the prevailing wind conditions and types of rockets to be flown.

4.16.2 All spectators shall remain behind the RSO and the person launching the rocket.

4.16.3 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 4.16.3, except as otherwise provided for in 4.16.3.1 through 4.16.3.4.

4.16.3.1 If the launch system or flight requires, the RSO shall be permitted to allow launch personnel to be no closer than one-half of the distance set forth in Table 4.16.3 or 152 m (500 ft), whichever is greater.

4.16.3.2 When firing circuits for pyrotechnic components on high power rockets are armed, no person shall be permitted to be at the launch pad except those required for arming and disarming operations and safety personnel designated by the RSO.

4.16.3.3 When three or more rockets are to be launched simultaneously, the minimum spectator and participant distance shall be twice the value set forth in Table 4.16.3 for a complex rocket with the same total installed impulse, but not more than 610 m (2000 ft), or 1.5 times the highest altitude expected to be reached by any of the rockets, whichever is less.

Table 4.15.1 Launcher Clear Distances

Installed Total Impulse		Launcher Equivalent	Minimum Clear Distance	
N-sec	lb-sec	Motor Type	m	ft
0.00–160.00	0.00–36.00	G or smaller	15	50
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

Table 4.16.3 Minimum Spectator and Participant Distance (Complex High Power Rocket)

Installed Total Impulse		Equivalent	Minimum Spectator and Participant Distance		Minimum Spectator and Participant Distance (Complex Rocket)	
N-sec	lb-sec	Motor Type	m	ft	m	ft
0.00–160.00	0.00–36.00	G or smaller	30	100	61	200
160.01–320.00	36.01–72.00	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

4.16.3.4 When more than one rocket is to be launched simultaneously, a minimum distance of 3 m (10 ft) shall exist between each rocket used for the launch.

4.16.4 Parking area distance shall be equal to at least the spectator and participant distance set forth in Table 4.16.3.

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 during ascent phase is intended to go into clouds, directly over the heads of spectators, or beyond the boundaries of the launch site, or so that the rocket's recovery is likely to occur in spectator areas or outside 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 RSO, and only under conditions where all the requirements of this code have been met.

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 RSO.

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.

4.18.3.1 A system shall be provided that permits the RSO to immediately warn all participants and spectators of rocket flight event anomalies that present a hazard to them.

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 RSO 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 rocket propellant weight of high power rocket motors, motor reloading kits, or pyrotechnic modules subject to the storage requirements of 27 CFR 555, "Commerce in Explosives," shall be stored in a Type 2 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 a 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 AHJ and the Bureau of Alcohol, Tobacco, Firearms, and Explosives.

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 555, "Commerce in Explosives," shall be stored in a closed, 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 rocket propellant weight of high power rocket motors, motor reloading kits, or pyrotechnic modules subject to the storage requirements of 27 CFR 555, "Commerce in Explosives," shall be stored in a Type 1, Type 2, or Type 4 outdoor magazine.
(2) The Type 1, Type 2, or Type 4 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	4,536	10,000	46	150	46	150	30	100
4,536	10,000	9,072	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 555, "Commerce in Explosives" (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 555, "Commerce in Explosives," a "User of Explosives Permit" shall be obtained prior to either of the following:

(1) Acquisition by a certified user of regulated materials
(2) Transportation by a certified user of regulated materials

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 AHJ.

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 AHJ
(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 rocket 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
(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 other than for the purpose of evaluation of new high power rocket motor technology by a recognized national user organization or an AHJ, 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 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 178, "Specifications for Packagings," 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.3.3.3 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.3.3.4 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.3.3.7 Inhabited Building. For further clarification, see ATF Ruling 2005-3. [**495,** 2013]

A.3.3.12 Range Safety Officer (RSO). At a high power rocket launch with only one certified user, the certified user also acts as the RSO.

A.3.3.18 Skyrockets or Rockets with Sticks. Such fireworks rockets are classified as Class 1.3G or 1.4G explosives in accordance with 49 CFR 173.50, 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 AHJ. In some instances, the AHJ utilizes lists maintained by the Tripoli Rocketry Association, Inc., 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.4.12.1.1 As a rocket leaves the launch device, it is subject to wind-induced aerodynamic factors that increase the chance of unstable flight. The effects of these factors can be mitigated by ensuring that the typical rocket leaves the launcher at a velocity of 3 to 4 times the maximum wind speed prevailing at the time of launch.

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.

A.4.16.1 Computer simulation and practice has shown that positioning of spectators cross-wind from the launching area is an effective method to mitigate impact risk due to recovery anomalies.

Annex B *High Power Rocket Safety Code* of the National Association of Rocketry

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

B.1 Background. The National Association of Rocketry (NAR) *High Power Rocket Safety Code* provides a concise summary of the specific user safety practices applicable to activities involving launching high power rockets.

B.2 Code. The following text is the *High Power Rocket Safety Code* in its entirety.

(1) **Certification**. I will only fly high power rockets or possess high power rocket motors that are within the scope of my user certification and required licensing.

(2) **Materials**. I will use only lightweight materials such as paper, wood, rubber, plastic, fiberglass, or when necessary ductile metal, for the construction of my rocket.

(3) **Motors**. I will use only certified, commercially made rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer. I will keep smoking, open flames, and heat sources at least 25 ft away from these motors.

(4) **Ignition System**. I will launch my rockets with an electrical launch system, and with electrical motor igniters that are installed in the motor only after my rocket is at the launching or prepping area. My launch system will have a safety interlock that is in series with the launch switch that is not installed until my rocket is ready for launch, and will use a launch switch that returns to the "off" position when released. The function of onboard energetics and firing circuits will be inhibited except when my rocket is in the launching position.

(5) **Misfires**. If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.

(6) **Launch Safety**. I will use a 5-second countdown before launch. I will ensure that a means is available to warn participants and spectators in the event of a problem. I will ensure that no person is closer to the launch pad than allowed by Table B.2. When arming onboard energetics and firing circuits I will ensure that no person is at the pad except safety personnel and those required for arming and disarming operations. I will check the stability of my rocket before flight and will not fly it if it cannot be determined to be stable. When conducting a simultaneous launch of more than one high power rocket I will observe the additional requirements of NFPA 1127.

(7) **Launcher**. I will launch my rocket from a stable device that provides rigid guidance until the rocket has attained a speed that ensures a stable flight, and that is pointed to within 20 degrees of the vertical. If the wind speed exceeds 5 miles per hour I will use a launcher length that permits the rocket to attain a safe velocity before separation from the launcher. I will use a blast deflector to prevent the motor's exhaust from hitting the ground. I will ensure that there is no dry grass within a clear distance of each launch pad determined by Table B.2, and will increase this distance by a factor of 1.5 and clear that area of all combustible material if the rocket motor being launched uses titanium sponge in the propellant.

(8) **Size**. My rocket will not contain any combination of motors that total more than 40,960 N-sec (9208 lb-sec) of total impulse. My rocket will not weigh more at liftoff than one-third of the certified average thrust of the high power rocket motor(s) intended to be ignited at launch.

(9) **Flight Safety**. I will not launch my rocket at targets, into clouds, near airplanes, or on trajectories that take it directly over the heads of spectators or beyond the boundaries of the launch site, and will not put any flammable or explosive payload in my rocket. I will not launch my rockets if wind speeds exceed 20 mph. I will comply with Federal Aviation Administration airspace regulations when flying, and will ensure that my rocket will not exceed any applicable altitude limit in effect at that launch site.

Table B.2 Minimum Distance Table

Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Clear Distance (ft)	Minimum Personnel Distance (ft)	Minimum Personnel Distance (Complex Rocket) (ft)
0–320.00	H or smaller	50	100	200
320.01–640.00	I	50	100	200
640.01–1,280.00	J	50	100	200
1,280.01–2,560.00	K	75	200	300
2,560.01–5,120.00	L	100	300	500
5,120.01–10,240.00	M	125	500	1000
10,240.01–20,480.00	N	125	1000	1500
20,480.01–40,960.00	O	125	1500	2000

Note: A complex rocket is one that is multi-staged or that is propelled by two or more rocket motors.
Source: National Association of Rocketry.

(10) **Launch Site**. I will launch my rocket outdoors, in an open area where trees, power lines, occupied buildings, and persons not involved in the launch do not present a hazard, and that is at least as large on its smallest dimension as one-half of the maximum altitude to which rockets are allowed to be flown at that site or 1500 ft, whichever is greater, or 1000 ft for rockets with a combined total impulse of less than 160 N-sec, a total liftoff weight of less than 1500 g, and a maximum expected altitude of less than 610 m (2000 ft).

(11) **Launcher Location**. My launcher will be at least one half the minimum launch site dimension, or 1500 ft (whichever is greater) from any occupied building, or from any public highway on which traffic flow exceeds 10 vehicles per hour, not including traffic flow related to the launch. It will also be no closer than the appropriate Minimum Personnel Distance from Table B.2 from any boundary of the launch site.

(12) **Recovery System**. I will use a recovery system such as a parachute in my rocket so that all parts of my rocket return safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.

(13) **Recovery Safety**. I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places, fly it under conditions where it may recover in spectator areas or outside the launch site, or attempt to catch it as it approaches the ground.

Annex C Sample Ordinance Adopting NFPA 1127

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

C.1 The following sample ordinance is provided to assist a jurisdiction in the adoption of this code and is not part of this code.

ORDINANCE NO. _____

An ordinance of the *[jurisdiction]* adopting the *[year]* edition of NFPA *[document number]*, *[complete document title]*, and documents listed in Chapter 2 of that *[code, standard]*; prescribing regulations governing conditions hazardous to life and property from fire or explosion; providing for the issuance of permits and collection of fees; repealing Ordinance No. _____ of the *[jurisdiction]* and all other ordinances and parts of ordinances in conflict therewith; providing a penalty; providing a severability clause; and providing for publication; and providing an effective date.

BE IT ORDAINED BY THE *[governing body]* OF THE *[jurisdiction]*:

SECTION 1 That the *[complete document title]* and documents adopted by Chapter 2, three (3) copies of which are on file and are open to inspection by the public in the office of the [jurisdiction's keeper of records] of the [jurisdiction], are hereby adopted and incorporated into this ordinance as fully as if set out at length herein, and from the date on which this ordinance shall take effect, the provisions thereof shall be controlling within the limits of the *[jurisdiction]*. The same are hereby adopted as the *[code, standard]* of the *[jurisdiction]* for the purpose of prescribing regulations governing conditions hazardous to life and property from fire or explosion and providing for issuance of permits and collection of fees.

SECTION 2 Any person who shall violate any provision of this code or standard hereby adopted or fail to comply therewith; or who shall violate or fail to comply with any order made thereunder; or who shall build in violation of any detailed statement of specifications or plans submitted and approved thereunder; or fail to operate in accordance with any certificate or permit issued thereunder; and from which no appeal has been taken; or who shall fail to comply with such an order as affirmed or modified by a court of competent jurisdiction, within the time fixed herein, shall severally for each and every such violation and noncompliance, respectively, be guilty of a misdemeanor, punishable by a fine of not less than $ _____ nor more than $_____ or by imprisonment for not less than _____ days nor more than _____ days or by both such fine and imprisonment. The imposition of one penalty for any violation

shall not excuse the violation or permit it to continue; and all such persons shall be required to correct or remedy such violations or defects within a reasonable time; and when not otherwise specified the application of the above penalty shall not be held to prevent the enforced removal of prohibited conditions. Each day that prohibited conditions are maintained shall constitute a separate offense.

SECTION 3 Additions, insertions, and changes — that the *[year]* edition of NFPA *[document number]*, *[complete document title]* is amended and changed in the following respects:

List Amendments

SECTION 4 That ordinance No. _____ of *[jurisdiction]* entitled *[fill in the title of the ordinance or ordinances in effect at the present time]* and all other ordinances or parts of ordinances in conflict herewith are hereby repealed.

SECTION 5 That if any section, subsection, sentence, clause, or phrase of this ordinance is, for any reason, held to be invalid or unconstitutional, such decision shall not affect the validity or constitutionality of the remaining portions of this ordinance. The *[governing body]* hereby declares that it would have passed this ordinance, and each section, subsection, clause, or phrase hereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, and phrases be declared unconstitutional.

SECTION 6 That the *[jurisdiction's keeper of records]* is hereby ordered and directed to cause this ordinance to be published.

[NOTE: An additional provision may be required to direct the number of times the ordinance is to be published and to specify that it is to be in a newspaper in general circulation. Posting may also be required.]

SECTION 7 That this ordinance and the rules, regulations, provisions, requirements, orders, and matters established and adopted hereby shall take effect and be in full force and effect *[time period]* from and after the date of its final passage and adoption.

Annex D Informational References

D.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this code and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

D.1.1 NFPA Publications. (Reserved)

D.1.2 Other Publications.

D.1.2.1 NAR Publications. National Association of Rocketry, P.O. Box 407, Marion, IA 52302.

High Power Rocket Safety Code, August 2012.

D.1.2.2 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

ATF Ruling 2005–3, U.S. Bureau of Alcohol, Tobacco, & Firearms (ATF), November 25, 2005.

Title 49, Code of Federal Regulations, Part 173.50, U.S. Department of Transportation.

D.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

D.2.1 NAR Publications. National Association of Rocketry, P.O. Box 407, Marion, IA 52302.

Comprehensive CAR/NAR/TRA Rocket Motor Certification List.

Model Rocket Safety Code, August 2012.

D.2.2 TRA Publications. Tripoli Rocketry Association, Inc., P.O. Box 87, Bellevue, NE 68005.

Comprehensive CAR/NAR/TRA Rocket Motor Certification List.

D.3 References for Extracts in Informational Sections.

NFPA 495, *Explosive Materials Code*, 2013 edition.

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