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Standard Consumer Safety Specification for Non-Powder Guns¹

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INTRODUCTION

This consumer safety specification is intended to address the primary causes of injuries involving non-powder guns and projectiles. Information concerning these injuries was obtained from data collected by the Consumer Product Safety Commission, hereinafter referred to as the Commission, consumer sounding boards, and the manufacturers' knowledge of the product and experience with consumer injuries.

The subcommittee regularly conducts comprehensive reviews from data provided by the Commission and has determined that carelessness, intentional misuse, or lack of adequate adult supervision, or a combination thereof, were factors in the shooting injuries examined.

To perform as intended, a non-powder gun requires a level of power which, if misused, can cause serious injury. This consumer safety specification is intended to reduce the hazards associated with non-powder gun use. This specification cannot control careless use or eliminate all hazards of misuse, but does provide for warnings of specific hazards and instructions for proper handling, use, and storage. Terminology is standardized in this specification, so that conforming products will be identified in the same manner, and critical dimensions are standardized to assure safe interchangeability of projectiles and propellants in all conforming non-powder guns. Product performance hazards are identified and requirements are established to minimize these hazards.

This consumer safety specification is written within the current state-of-the-art of non-powder gun technology. The intent is to revise this consumer safety specification whenever substantive information becomes available which justifies revising existing requirements or adding new requirements.

1. Scope

1.1 This consumer safety specification covers non-powder guns, commonly referred to as BB guns, air guns, and pellet guns, which propel a projectile by means of energy released by compressed air, compressed gas, mechanical spring action, or a combination thereof, and is to be used in conjunction with Specification F590.

1.2 Special-purpose match precision and adult guns, as defined in 3.1 and classified in 8.1 and 8.2, are exempt from the performance requirements for trigger mechanisms (see 4.3), safety mechanisms (see 4.4), and drop tests (see 4.5).

1.3 Special-purpose training guns, as defined in 3.1 and classified in 8.3, are exempt from the performance requirements for the safety mechanism (see 4.4).

1.4 *Limitations*—This consumer safety specification does not cover the following categories of gun products: cl custom-made non-powder guns (see 3.1.2.6); or replica guns (see 3.1.2.15); tranquilizer dart guns; toy products such as rubber-band guns, cork guns, pop guns, rubber-tip dart guns, or pea and bean shooters; other recreational-type guns such as blow guns, spear guns, catapult guns (also identified as sling shots), bows, crossbows, paintball markers, air soft or soft air guns, or carbide guns; nonrecreational guns such as those used by law enforcement, scientific, or military agencies; nor industrial and consumer tools such as paintball guns, staple guns, or conduit guns.

1.5 The values stated in inch-pound units are to be regarded as the standard; the SI units in parentheses are provided for information only.

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1.6 The following precautionary caveat pertains only to the test method portion, Section 9, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards*:²

F590 Consumer Safety Specification for Non-Powder Gun Projectiles and Propellants

2.2 *ANSI Standard*:³

ANSI Z535 Product Safety Signs and Labels

2.3 *NIST Standard*:⁴

NIST Special Publication 811 Physical Constant-Standard Acceleration of Gravity, Conversion Factors in Appendix

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *Propellant System Terms:*

3.1.1.1 *CO₂ (carbon dioxide)*—a propulsion system in which the energy is provided by CO₂ (carbon dioxide) usually stored in a removable cylinder. The release of the CO₂ gas provides the energy to propel the projectile.

3.1.1.2 *combination system*—a propulsion system in which a combination of spring, spring-piston, pneumatic, and CO₂ systems can be used to provide the energy to propel the projectile.

3.1.1.3 *pneumatic*—a propulsion system in which compressed air is stored under pressure and, when released, provides the energy to propel the projectile. A pneumatic gun normally has a pump system to provide the compressed air.

3.1.1.4 *pre-charged pneumatic*—a propulsion system in which the energy is provided by compressed gas, normally compressed air, stored in a refillable cylinder charged by an external source. The release of the compressed gas provides the energy to propel the projectile.

3.1.1.5 *spring-piston (also known as a spring-air or adiabatic system)*—a propulsion system in which the projectile is propelled by air pressure that is created by a piston moved by a spring.

3.1.1.6 *spring-type*—a propulsion system in which the projectile is placed into motion by direct contact with a spring or a carrier moved directly by a spring.

3.1.2 *Non-Powder Gun Terms:*

3.1.2.1 *adult gun*—a non-powder gun that meets the design characteristics of 8.2 and is so designated by the manufacturer.

3.1.2.2 *antique air gun*—a non-powder gun that is more than 50 years of age.

3.1.2.3 *backstop*—an object intended to stop a projectile.

3.1.2.4 *barrel*—that portion of a non-powder gun through which the projectile is discharged.

3.1.2.5 *cocking mechanism*—a device that allows the user to store manual energy.

3.1.2.6 *custom gun*—a non-powder gun designed or made to the specifications of an individual consumer. m-1589-12

3.1.2.7 *feed mechanism*—a mechanism that stores, transports, and loads projectiles. It may be manual, repeater, or automatic in its actions.

3.1.2.8 *hammer*—a device which, when released, discharges the stored energy.

3.1.2.9 *magazine*—a device used in a gun to store projectiles.

3.1.2.10 *non-powder gun*—a device specifically designed to discharge BB's, pellets, or darts by the release of energy stored by compressed air, compressed CO₂, mechanical springs, or a combination thereof.

3.1.2.11 *piercing assembly (CO₂ gun)*—a device that is used to release gas from the CO₂ cylinder after the CO₂ cylinder has been correctly positioned in the gun.

3.1.2.12 *pumping mechanism (pneumatic gun)*—a mechanical device used to compress air.

3.1.2.13 *match precision gun*—a non-powder gun that meets the performance characteristics in 8.1 and is so designated by the manufacturer.

3.1.2.14 *receiver*—the main body of a rifle, shoulder gun, or long gun that houses all or most of its operating mechanisms.

3.1.2.15 *replica gun*—a functional non-powder gun manufactured to duplicate an antique non-powder gun.

3.1.2.16 *ricochet*—rebound or deflection of a projectile from a surface.

3.1.2.17 *safety, automatic*—a safety mechanism that is activated when the cocking mechanism is operated in a normal manner and must be manually deactivated by an independent action of the shooter to allow the gun to be fired by the movement of the trigger.

3.1.2.18 *safety, manual*—a safety mechanism that must be activated by an independent and deliberate action of the shooter and must be similarly released to allow the gun to be fired by the movement of the trigger.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁴ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 3460, Gaithersburg, MD 20899-3460.

3.1.2.19 *safety mechanism*—a device which, when activated either automatically or manually, locks a part of the non-powder gun, usually the trigger, to prevent unintentional firing in normal use. The device is sometimes referred to as a safety, safety button, or safety lever.

3.1.2.20 *sear*—the catch that holds the mechanism in the ready-to-fire position until released by the user, through trigger movement.

3.1.2.21 *shot-start force*—the force that is required to insert a non-powder gun projectile into a cavity of standard size for a given caliber.

3.1.2.22 *single-shot gun*—a gun that requires individual manual loading for each shot.

3.1.2.23 *striker*—*see hammer*.

3.1.2.24 *target*—the object at which the projectile is discharged.

3.1.2.25 *training gun*—a non-powder gun that meets the requirements in 8.3 and is so designated by the manufacturer.

3.1.2.26 *trigger*—a device operated by the user to fire a gun.

3.1.2.27 *trigger, adjustable*—a trigger mechanism in which the trigger pull is adjustable.

3.1.2.28 *trigger, double-action*—a trigger mechanism in which a single continuous action of the trigger moves the hammer to the firing position and then releases it to discharge the projectile.

3.1.2.29 *trigger guard*—a rigid component of a non-powder gun that, together with the receiver frame or stock, completely encircles the trigger.

3.1.2.30 *trigger pull*—the force required to move the trigger from its fully engaged position to a position that fires the gun.

3.1.2.31 *trigger, single-action*—a trigger mechanism in which the hammer must be manually cocked for each shot.

3.1.2.32 *trigger, two-stage*—a trigger mechanism in which the first stage movement allows the trigger to be moved with minimum force until it encounters a resistance. The second stage requires an increased force to cause disengagement and firing of gun.

3.1.2.33 *valve*—a device used to release CO₂ or air from a storage chamber into the barrel during a firing cycle.

4. Performance Requirements

4.1 *Gun Function*—The cocking or pumping mechanism of a non-powder gun shall not cause a gun to discharge unintentionally while the gun is being cocked in accordance with the manufacturer's instructions. The feed mechanism of a non-powder gun shall not cause unintentional discharge of a projectile when a gun is used in accordance with the manufacturer's instructions. Tests shall be conducted in accordance with 9.1. If the characteristics of a cocking or pumping mechanism are such that pinch points may be exposed while a gun is being cocked, instructions and warnings identifying the hazard and providing safe procedures shall be provided with each gun in accordance with 10.4.1.9.

4.2 *Barrel Performance*—Non-powder guns shall have sufficient energy to expel the projectile intended for use with a gun when used in accordance with the manufacturer's instructions. Test shall be conducted in accordance with 9.2.

4.3 Trigger Mechanism:

4.3.1 The weight applied to the trigger necessary to fire a non-powder gun shall be more than 3 lb (1.35 kg) and less than 16 lb (7.3 kg). Tests shall be conducted in accordance with 9.3.

4.3.2 An adjustable trigger mechanism that is adjustable to below 2 lb (0.9 kg) must have some part of its trigger pull range above 3 lb (1.35 kg) but less than 16 lb (7.3 kg) (see 5.4.2 and 10.4.6).

4.3.3 The match precision and adult guns (see 8.1 and 8.2) are exempt from the 3 lb (1.35 kg) minimum trigger pull. This exemption shall be specified on the packages containing the special-purpose non-powder guns in accordance with 10.2.7 and in the literature packed with the gun in accordance with 10.4.4.

4.4 Safety Mechanism:

4.4.1 Safety mechanisms shall be provided on all non-powder guns except the special-purpose guns (Section 8) which may or may not be provided with safety mechanisms. All safety mechanisms shall be clearly marked to indicate the safe and fire positions in accordance with 10.3.4. All safety mechanisms shall be capable of preventing the guns from being fired when a weight of 30 lb (13.6 kg) is applied to the trigger. Tests shall be conducted in accordance with 9.4.

4.4.2 Special-purpose non-powder guns (Section 8), are exempt from this requirement. This exemption shall be clearly specified on the packaging in accordance with 10.2.7 and in the literature packed with the gun in accordance with 10.4.4.

4.5 Drop Test:

4.5.1 Non-powder guns shall be capable of withstanding a 36-in. (914-mm) drop without firing. Tests shall be conducted in accordance with 9.5.

4.5.2 The match precision and adult guns (see 8.1 and 8.2) are exempt from this requirement. This exemption shall be clearly specified on the packaging in accordance with 10.2.7 and in the literature packed with the gun in accordance with 10.4.4.

4.6 *Structural Integrity Requirement for CO₂ Guns*—CO₂ guns shall be constructed to prevent the full or partially filled CO₂ cylinder from being propelled from the gun while the cylinder is being emptied, installed, or removed.

4.7 *Temperature Test for CO₂ Guns*—CO₂ guns shall be capable of retaining the CO₂ cylinder in a pierced state when both are heated to a temperature of 160°F (71°C) and maintained for ½ h without structural failure of the gun. Tests shall be conducted in accordance with 9.6. Seal failure between the gun and cylinder is acceptable.

5. General Requirements

5.1 *Literature*—Literature shall be provided with each non-powder gun and shall include, as applicable, the instructions and cautionary statements specified in Section 10.

5.1.1 *Muzzle Velocity*—The muzzle velocity of the projectile of the non-powder gun shall be included in the muzzle velocity statement (see 10.4.1.4) and shall be determined in accordance with 9.7.

5.1.2 *Maximum Distance*—The maximum distance shall be included in the distance statement (see 10.4.1.4) and shall be determined in accordance with 9.8.

5.2 *Packaging*—Packaging shall be labeled in a prominent and conspicuous manner in accordance with the provisions of Section 10.

5.3 *Finish*—The exposed metal and plastic edges of all non-powder guns shall be smooth and free of sharp edges and burrs. The exposed surface of all wood parts shall be smooth and free of splinters.

5.4 Shipping:

5.4.1 Each non-powder gun shall be shipped in an unloaded, uncharged, and uncocked condition.

5.4.2 All non-powder guns with adjustable triggers shall have their triggers adjusted to fire at more than 2 lb (0.9 kg) and less than 16 lb (7.3 kg) at the time of shipment by the manufacturer.

5.5 All non-powder guns with an exposed, mechanical trigger shall have a trigger guard equal to or greater in width than the trigger.

6. Significance and Use

6.1 This consumer safety specification establishes performance requirements and test methods intended to provide a reasonable degree of safety in the normal use of non-powder guns and projectiles.

6.2 This consumer safety specification attempts to address the misuse of non-powder guns and specifies the minimum warnings and instructions that are to be provided in literature and on labels and packages.

7. Conformance

7.1 Non-powder guns shall not, either by label or other means, indicate conformance with this consumer safety specification unless they conform with the applicable requirements contained herein.

7.2 Any statement or symbol on the gun, package, or literature that is used to indicate that a special-purpose non-powder gun conforms with this consumer safety specification shall, where applicable, also specify the exemptions that are specifically provided for herein.

8. Classification of Special-Purpose Non-Powder Guns (See Table 1)

8.1 Match Precision Guns:

8.1.1 *Rifle*—To be classified as a match precision rifle, a non-powder gun shall be capable of firing a five-shot group such that the centers of all five shots fall within a 0.30-in. (7.6-mm) circle. The target shall be fired at a distance of 32.8 ft (10 m). These results can be obtained by shooting offhand or by using a bench rest or mechanical rest and may be evidenced by serial-numbered factory test target, fired in accordance with this specification.

8.1.2 *Hand Gun*—To be classified as a match precision hand gun, a non-powder gun shall be capable of firing a five-shot group such that the centers of all five shots fall within a 0.40-in. (10.2-mm) circle. The target shall be fired at a distance of 32.8 ft (10 m). These results can be obtained by shooting offhand or by using a bench rest or mechanical rest and may be evidenced by serial-numbered test targets, fired in accordance with this specification.

TABLE 1 Classification of Special-Purpose Non-Powder Guns^A

Classification	Exemption		
	Trigger Mechanism (4.3)	Safety Mechanism (4.4)	Drop Test (4.5)
Match-precision gun (8.1)	yes	yes	yes
Adult gun (8.2)	yes	yes	yes
Training gun (8.3)	no	yes	no

^A All special-purpose non-powder guns must comply with the special marking requirements specified in Section 10 to the extent that any of the exemptions are used.

8.2 *Adult Guns:*

8.2.1 *Rifle*—To be classified as an adult rifle, a non-powder gun shall meet the following criteria:

8.2.1.1 Is a single-shot gun,

8.2.1.2 Is capable of attaining a muzzle velocity of 550 ft/s (167.6 m/s) when firing projectiles 0.177 cal (4.5 mm) or smaller or 400 ft/s (121.9 m/s) when firing projectiles larger than 0.177 cal,

8.2.1.3 Has a rifled barrel,

8.2.1.4 Has a minimum overall length of 36 in. (916 mm),

8.2.1.5 Has a minimum weight of 5.3 lb (2.4 kg),

8.2.1.6 Has a rear sight adjustable for windage and elevation or has a receiver designed to mount an adjustable rear sight,

8.2.1.7 Has a hooded front sight or is designed for telescopic sight use, and

8.2.1.8 Has an adjustable or two-stage trigger.

8.2.2 *Hand Gun*—To be classified as an adult hand gun, a non-powder gun shall meet the following criteria:

8.2.2.1 Is capable of attaining a muzzle velocity of 320 ft/s (97.6 m/s) when firing projectiles 0.177 cal (4.5 mm) or smaller or 280 ft/s (85.3 m/s) when firing a projectile larger than 0.177 cal,

8.2.2.2 Has a rifled barrel,

8.2.2.3 Has a minimum overall barrel length of 6 in. (152 mm),

8.2.2.4 Has a minimum weight of 1.75 lb (0.8 kg),

8.2.2.5 Has a rear sight adjustable for windage and elevation,

8.2.2.6 Has a front sight, and

8.2.2.7 Has an adjustable or two-stage trigger.

8.3 *Training Guns*—Training guns are special-purpose guns intended for use in organized educational shooting programs. Training guns are distributed through restricted programs under which they are made available only to clubs and organizations for use in their non-powder gun training programs.

9. Test Methods

NOTE 1—No precision statement on any of the following test methods is available at this time.

9.1 *Gun Function Test:*

9.1.1 *Significance*—This method is performed to ensure that the gun, when operated in accordance with the manufacturer's operating instructions, will feed properly and will not discharge accidentally during the cocking or pumping and feeding cycle of the gun.

9.1.2 *Apparatus:*

9.1.2.1 Manufacturer's operating instructions for the non-powder gun,

9.1.2.2 Projectiles and propellants conforming to Specification **F590**, and

9.1.2.3 Appropriate back stop.

9.1.3 *Test Specimen*—The test specimen shall consist of a new non-powder gun, selected in accordance with the manufacturer's usual quality assurance practices.

9.1.4 *Procedure:*

9.1.4.1 Conduct the test at room temperature (60 to 80°F (16 to 27°C)).

9.1.4.2 Insert the CO₂ cylinder (if required) and load the projectile magazine or chamber of a non-powder gun to capacity. For a gun of variable power, such as the CO₂ or pneumatic gun, cock or set the gun for the lowest power recommended by the manufacturer to fire the gun.

9.1.4.3 Operate the gun in accordance with the manufacturer's instructions. Test fire the gun until all the projectiles have been discharged. Reload the gun, if required, and continue to fire until a minimum of 100 projectiles have been discharged.

9.1.4.4 Repeat the test at the highest power settings for guns capable of variable power.

9.1.4.5 The gun passes the test if no accidental discharge of a projectile occurred and a projectile is discharged each time the gun is fired during the test.

9.2 *Barrel Performance:*

9.2.1 *Significance*—This method is intended to determine if the barrel of a gun is of sufficient size to allow a projectile to pass freely and completely through the barrel when the gun is operated in accordance with the manufacturer's instructions.

9.2.2 *Apparatus:*

9.2.2.1 Manufacturer's operating instructions for the gun,

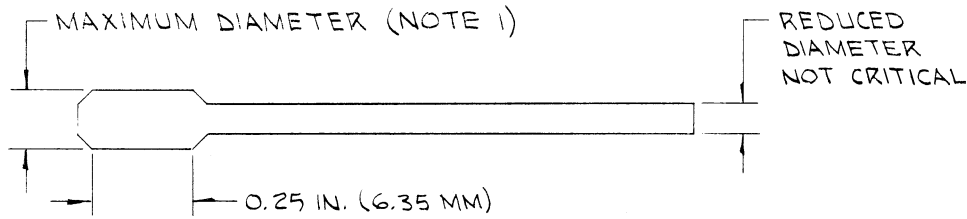
9.2.2.2 Projectiles for the gun which have shot-start forces at the high limit for the projectiles in accordance with Specification **F590**,

9.2.2.3 CO₂ cylinders, if required,

9.2.2.4 Barrel performance test gage as shown in **Fig. 1** with dimensions as described in **Table 2**, and

9.2.2.5 Appropriate back stop.

9.2.3 *Test Specimen*—The test specimen shall consist of a new non-powder gun, selected in accordance with the manufacturer's usual quality assurance practices.



NOTE 1—See Table 2 for value of minimum bore diameter and select diameter of projectile to be used.
 NOTE 2—Overall length sufficient to allow the measurement of the full bore length being gaged.

FIG. 1 Barrel Performance Test Gage

TABLE 2 Non-Powder Gun Bore Dimensions

Projectile	Caliber	Minimum Bore Diameter, in. (mm)
Air gun shot, steel	BB (4.5 mm)	0.1755 (4.458)
Air gun shot, lead	0.177 (4.5 mm)	0.1755 (4.458)
Air gun shot, steel	0.22 (5.5 mm)	0.2203 (5.596)
Air-gun dart	0.177 (4.5 mm)	0.1755 (4.458)
Air-gun dart	0.22 (5.5 mm)	0.2203 (5.596)

9.2.4 Procedure:

9.2.4.1 Conduct the test at room temperature (60 to 80°F (16 to 27°C)).

9.2.4.2 Pass the barrel bore test gage through the muzzle and the full length of the bore of the gun. The test gage should pass freely through the bore. Remove the gage from the muzzle end.

NOTE 2—Guns designed to discharge lead projectiles only are exempt from the bore gage requirement and may be tested in accordance with 9.2.4.3.

9.2.4.3 Load the gun with projectiles (and CO₂ cylinder if required). Operate the gun and discharge projectiles in accordance with the manufacturer’s operating instructions for the gun. Discharge a minimum of five projectiles which have the maximum shot-start force. If the gun is capable of variable power (such as a pneumatic or CO₂ gun), the minimum power setting recommended by the manufacturer shall be used for this test.

9.2.4.4 The gun passes if the barrel bore test gage passed freely through the bore and all projectiles were discharged from the barrel when fired in the intended manner. Guns intended to shoot only lead projectiles (see Note 2) pass the test if all projectiles were discharged from the barrel when fired in the intended manner.

9.3 Trigger Pull Test:

9.3.1 Significance—This method determines if the force required to pull the trigger to fire a non-powder gun is within the 3 to 16-lbf (8.9 to 71.2-N) range.

9.3.2 Apparatus:

9.3.2.1 A trigger weight system having a 3 ± 0.05-lb (1.35 ± 0.23 kg) weight and a 16 ± 0.20-lb (7.3 ± 0.09 kg) weight. The weight system shall be arranged so that the weights can be picked up by the trigger of the gun with the gun in a vertical position, muzzle up. (A spring gage, capable of measuring the trigger force, can be used instead of the weight system.)

9.3.2.2 Manufacturer’s operating instructions for the non-powder gun.

9.3.3 Test Specimen—The test specimen shall consist of a new non-powder gun, selected in accordance with the manufacturer’s usual quality assurance practices.

9.3.4 Procedure:

9.3.4.1 Conduct the test at room temperature (60 to 80°F (16 to 27°C)).

9.3.4.2 Conduct all tests without projectiles in the gun.

9.3.4.3 Cock or pump the gun.

9.3.4.4 Position the gun so that it can vertically lift the weight system with the weight suspended from the center of the face of the trigger.

9.3.4.5 Lift the gun slowly to lift the weight system by the trigger of the gun with the 3-lb (1.35 kg) weight in place. The gun should not fire.

9.3.4.6 Lift the gun slowly to lift the weight system by the trigger of the gun with the 16-lb (7.3 kg) weight in place. The gun should fire.

9.3.4.7 Recock the gun and repeat 9.3.4.5 and 9.3.4.6 five times.

9.3.4.8 If the gun is capable of variable power (CO₂ and pneumatic systems), conduct the test at both the minimum and maximum powers recommended for use by the manufacturer. Test guns having single and double-action triggers in both modes.

9.3.4.9 The gun passes if it lifts a 3-lb (1.35 kg) weight without firing and fires during the application of the 16-lb (7.3 kg) weight.