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Standard Specification for Airsoft Guns[1]

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INTRODUCTION

To perform as intended, an airsoft gun requires a level of power which, if misused, can cause serious injury. This specification is intended to reduce the hazards associated with airsoft gun use. This specification cannot control careless use or eliminate all hazards of misuse. 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 in all conforming airsoft guns. Product performance hazards are identified and requirements are established to minimize these hazards. This specification is written within the current state-of-the-art of airsoft gun technology. The intent is to revise this specification whenever substantive information becomes available which justifies revising existing requirements or adding new requirements.

1. Scope

1.1 This specification covers airsoft guns which propel a projectile by means of energy released by compressed gas, compressed CO_2, mechanical springs, battery or a combination thereof, used in the sport commonly called airsoft or air soft, and is to be used in conjunction with Specification F2654.

1.2 *Limitations*—This specification does not cover the following types of products: Non-powder guns as specifically defined in Consumer Safety Specification F589 and which are commonly referred to as BB or pellet guns; paintball markers as specifically defined in Specification F2272; toy products; and non-recreational air guns, for example, those used by law enforcement, scientific, military, industrial, or theatrical entities.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *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]

F589 Consumer Safety Specification for Non-Powder Guns
F2272 Specification for Paintball Markers
F2654 Specification for Airsoft Gun Warnings
F2679 Specification for 6 mm Projectiles Used with Airsoft Guns

2.2 *Code of Federal Regulations:*[3]

15 CFR 1150 Marking of Toy, Look-Alike and Imitation Firearms

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *airsoft gun, n*—commonly referred to as airsoft gun, air soft gun, or soft air gun, or any combination thereof, or a low energy air gun (LEAG), refers to a device specifically designed to expel a projectile as described in Specification F2679, by the release of energy by compressed air, compressed gas, mechanical springs, battery, or a combination thereof.

3.1.2 *airsoft gun projectile, n*—spherical, of 6 mm (.24 cal) diameter, non-metallic and non-liquid filled projectile to be used in an airsoft gun as specifically referred to in Specification F2679.

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[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 U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

3.1.2.1 *Discussion*—These are also referred to as airsoft BB's.

3.1.3 *backstop, n*—object intended to stop an airsoft gun projectile.

3.1.4 *barrel, n*—that portion of an airsoft gun through which the projectile is discharged.

3.1.5 *cocking, v*—action that allows the user to store manual energy.

3.1.6 *hammer, n*—device which, when released, discharges the stored energy.

3.1.7 *hop-up, n*—device that changes the spin on a projectile to affect its trajectory.

3.1.8 *magazine, n*—device used in an airsoft gun to store projectiles.

3.1.9 *propulsion system, combination, n*—propulsion system in which a combination of spring, spring-piston, pneumatic, or gas systems can be used to provide the energy to propel the projectile.

3.1.10 *propulsion system, electronic, n*—propulsion system in which an electronic system is used to provide the energy to propel the projectile.

3.1.11 *propulsion system, gas, n*—propulsion system in which a gas system, including CO_2, is used to provide the energy to propel the projectile. CO_2 propulsion system is a type of gas propulsion system.

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

3.1.13 *propulsion system, pneumatic, n*—propulsion system in which compressed air is stored under pressure and, when released, provides the energy to propel the projectile.

3.1.13.1 *Discussion*—A pneumatic airsoft gun normally has a pump system to provide the compressed air.

3.1.14 *propulsion system, pre-charged pneumatic, n*—propulsion system in which the energy is provided by compressed gas, normally compressed air, stored in a refillable cylinder charged by an external source.

3.1.14.1 *Discussion*—The release of the compressed gas provides the energy to propel the projectile.

3.1.15 *pumping mechanism (pneumatic gun), n*—mechanical device used to compress air.

3.1.16 *range, n*—maximum distance to which an object may be propelled, whether limited by energy or an obstacle.

3.1.17 *safety device, n*—device which, when activated, disables a part of the airsoft gun, usually the trigger, to prevent unintentional discharges and must be released to allow the airsoft gun to be discharged by the movement of the trigger.

3.1.17.1 *Discussion*—The device is sometimes referred to as the "safety," "safety button," or "safety lever." An electronic on/off switch is considered a safety device when placing it in the "off" position renders the airsoft gun inoperable.

3.1.18 *standard ambient temperature and pressure (SATP), n*—used to describe a substance at the pressure of 1 bar (1.01325 atmospheres, 750 mm Hg, 14.5 psi, 100 kPa) and a temperature of 25°C (77°F).

3.1.19 *target, n*—object at which the airsoft gun is discharged.

3.1.20 *trigger, n*—device operated by the user to discharge an airsoft gun.

3.1.21 *trigger guard, n*—rigid, firmly attached component that must totally enclose the trigger area and be wider than the trigger.

3.1.21.1 *Discussion*—There can be no more than 38 mm (1.5 in.) of space from any point on the face of the trigger to the trigger guard, and no more than 13 mm (0.5 in.) from the lowest point of the trigger to the trigger guard. All measurements under this rule are to be taken after excluding any removable attachments to the trigger.

3.1.22 *trigger pull, n*—force required to move the trigger from its start or recycle/reset position to a position that discharges the airsoft gun.

4. Significance and Use

4.1 This specification establishes performance requirements and test methods for airsoft guns.

5. Conformance

5.1 Airsoft guns shall not, either by label or other means, indicate conformance with this specification unless, at the time of manufacture, they conform with all applicable requirements contained herein.

6. General Requirements

6.1 *Literature*—Each airsoft gun shall include the product literature as specified in Specification F2654.

6.2 *Packaging*—The packaging of each airsoft gun shall comply, as applicable, with Specification F2654.

6.3 *Product Marking*—Airsoft guns shall be marked in accordance with Specification F2654.

6.4 *Finish*—The exposed edges of all airsoft guns shall be smooth and free of sharp edges, burrs, and splinters.

6.5 *Shipping:*

6.5.1 Each airsoft gun shall be shipped in an unloaded, uncharged, and uncocked condition.

6.5.2 All airsoft guns must shoot at an energy level under 2.9 joules at the time of shipment at SATP.

6.6 *Design:*

6.6.1 All airsoft guns with an exposed trigger shall have a trigger guard.

6.6.2 It is the responsibility of the manufacturer to determine whether federal markings are required on its airsoft guns and to follow all applicable regulations (see 15 CFR 1150).

7. Performance Requirements

7.1 *Airsoft Gun Function*—Cocking, pumping, loading, or charging of an airsoft gun shall not cause the airsoft gun to discharge except in accordance with the manufacturer's instructions. This does not limit the use of "auto-triggers."

7.2 *Safety Device*—Safety devices shall be provided on all airsoft guns and all such devices can be activated whether or not the airsoft gun is cocked. All such devices shall be clearly marked to indicate the "safe" and "fire" or "on" and "off" positions, or an indicator on the safety device which exposes both a red color and a groove when the airsoft gun is in the "fire position." All such devices shall be capable of preventing the airsoft gun from being discharged when a weight of 9.1 kg (20 lb) is applied to the trigger. Tests shall be conducted in accordance with 8.3.

7.3 *Accidental Discharge*—Airsoft guns should not accidentally discharge when exposed to a drop in accordance with 8.4.

7.4 *Trigger Mechanism*—The weight applied to the trigger necessary to fire an airsoft gun shall be more than 1 ± 0.05 lb (0.45 ± 0.09 kg) weight and less than 16 ± 0.20 lb (7.3 ± 0.09 kg). Tests shall be conducted in accordance with 8.5.

7.5 *Barrel Diameter Size*—The barrel diameter (excluding hop-up mechanism) of an airsoft gun must be no less than the maximum size of projectile designed for that airsoft gun (for example, 6 mm for an airsoft gun which will shoot 6 mm projectiles).

7.6 *Structural Integrity Requirement for Airsoft Guns Using CO_2 Propulsion Systems*—Airsoft guns using CO_2 propulsion systems shall be constructed to prevent the full or partially filled CO_2 cylinder from being propelled from the gun while the cylinder is being emptied, installed, or removed.

7.7 *Temperature Test for Airsoft Guns Using CO_2 Propulsion Systems*—Airsoft guns using CO_2 gas propulsion systems shall be capable of retaining the CO_2 and the cylinder in a pierced state when both are heated to a temperature of 160 ± 5°F (71 ± 2.7°C) and maintained for ½ h without structural failure of the airsoft gun. Tests shall be conducted in accordance with 8.6. Seal failure between the airsoft gun and cylinder is acceptable.

7.8 *Muzzle Energy*—Airsoft guns shall have a muzzle energy of 2.9 joule or less. Tests shall be conducted in accordance with 8.8.

8. Test Methods

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

8.2 *Airsoft Gun Function Test:*

8.2.1 *Significance*—This method is performed to ensure that the airsoft gun, when operated in accordance with the manufacturer's operating instructions, will not discharge except in accordance with the manufacturer's instructions during cocking, pumping, loading, and charging.

8.2.2 *Apparatus:*

8.2.2.1 Manufacturer's operating instructions for the airsoft gun.

8.2.2.2 Projectiles conforming to Specification F2679 and manufacturer's recommended propellants.

8.2.2.3 Appropriate back stop.

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

8.2.4 *Procedure:*

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

8.2.4.2 Insert the manufacturer's recommended propellant (if required) and load the projectile magazine or chamber of an airsoft gun to capacity.

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

8.2.4.4 If an airsoft gun has variable functions (power, hop-up, mode, etc.) test the airsoft gun with at least 10 projectiles for each of the possible combination of such variables.

8.2.4.5 The airsoft gun passes the test if no discharge of a projectile occurred except in accordance with manufacturer's instructions.

8.3 *Safety Device Test:*

8.3.1 *Significance*—This method determines if the safety device will withstand a 9.1 kg (20 lb) applied weight without failure, causing the airsoft gun to discharge.

8.3.2 *Apparatus*—A trigger weight system having a 9.1 ± 0.02 kg (20 ± 0.05 lb) weight. Arrange the weight system so that the weight can be picked up by the trigger of the airsoft gun with the airsoft gun in a vertical position, muzzle up. (A spring gauge, capable of measuring the trigger force, can be used instead of weight system.)

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

8.3.4 *Procedure:*

8.3.4.1 Conduct the test at SATP.

8.3.4.2 Conduct all tests without projectiles in the airsoft gun.

8.3.4.3 Place safety device in "safe" position or the electronic switch in the "off" position.

8.3.4.4 Apply a 9.1 kg (20 lb) load at the center point of the trigger for 20 s with the load applied to the center of the face of the trigger and remove the load.

8.3.4.5 Put safety device in the "fire" position or the electronic switch in the "on" position. The airsoft gun must not discharge as the safety is disengaged.

8.3.4.6 Test the airsoft gun for proper trigger and safety device action.

8.3.4.7 The airsoft gun passes the test if it withstands the load applied without causing it to discharge during the application of the load and does not discharge upon the disengagement of the safety device, and the safety device functions properly after testing.

8.4 *Accidental Discharge Test (Drop Test):*

8.4.1 *Significance*—This method determines if the airsoft gun will withstand a drop of 36 in. (914 mm) without firing and without allowing the manufacturer's recommended propellant to escape (if such propellant is used).

8.4.2 *Apparatus:*

8.4.2.1 *Rubber Mat,* a minimum of 50 durometer Type A, 1 in. (25 mm) thick and large enough so that when the airsoft gun is dropped it will land entirely within the perimeter of the mat.

8.4.2.2 *Concrete Floor,* on which to place the mat.

8.4.2.3 *Measure,* 36-in. (914-mm), to establish the height of the drop.

8.4.2.4 *Weight,* equal to the weight of the test specimen and having a base of no more than 4 in. (102 mm) on any one side.

8.4.2.5 *Manufacturer's Recommended Propellant,* if required for airsoft gun operation.

8.4.2.6 *Projectiles,* to fill the magazine or an equivalent weight.

8.4.3 *Test Specimen*—The test specimen shall consist of new airsoft guns, selected in accordance with the manufacturer's usual quality assurance practices.

8.4.4 *Procedure:*

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

8.4.4.2 Without any projectile in the ready-to-fire position, prepare the airsoft gun for firing by energizing and cocking it. If the airsoft gun has a safety mechanism, place the safety mechanism in the "fire" or "off" position. If the airsoft gun has an automatic safety which requires that the safety be held in the "fire" or "off" position to fire, test the airsoft gun with the safety in the "safe" or "on" position. If the airsoft gun has an adjustable trigger, adjust the trigger to its lowest setting, but in no case less than 1 lb (0.45 kg). If the airsoft gun is equipped with a magazine device, the magazine should be in place and loaded or an additional weight equal to the weight of a fully loaded magazine can be attached to the airsoft gun. Prior to dropping, be certain there is no projectile in the ready-to-fire position.

8.4.4.3 Hold the airsoft gun 36 in. (914 mm) above the mat, measured from the point on the airsoft gun that is nearest the mat. Drop the airsoft gun in the following six orientations:

(1) With barrel vertical so that the butt of the airsoft gun hits the mat.

(2) With barrel vertical so that the muzzle of the airsoft gun hits the mat.

(3) With barrel horizontal so that the bottom of the airsoft gun hits the mat.

(4) With barrel horizontal so that the top of the airsoft gun hits the mat.

(5) With barrel horizontal so that the right side of the airsoft gun hits the mat.

(6) With barrel horizontal so that the left side of the airsoft gun hits the mat.

NOTE 1—A separate airsoft gun may be used for each drop.

8.4.4.4 Test the airsoft gun after each drop to determine if the airsoft gun fired when dropped.

8.4.4.5 If the airsoft gun has an exposed hammer, conduct one additional test as follows: Disengage the safety, if the airsoft gun has a safety mechanism. Lay the airsoft gun on the mat, supporting it if necessary, such that the hammer is exposed on top or at the uppermost part of the airsoft gun. Drop the weight (8.4.2.4) from a height of 36 in. (914 mm), base first on the hammer, to determine whether this force when applied to the hammer will fire the airsoft gun.

8.4.4.6 Examine the airsoft gun to determine that the airsoft gun did not fire when dropped and inspect the airsoft gun to determine if the manufacturer's recommended propellant is in place (if such is used).

8.4.4.7 Repeat all tests in 8.4.4.2, 8.4.4.3, and 8.4.4.4 with the safety in the "safe" or "on" position.

8.4.4.8 After each drop with the safety "on," disengage the safety and determine if the airsoft gun fires while the safety is being disengaged.

8.4.4.9 If the airsoft gun has an exposed hammer, repeat 8.4.4.5 with the safety "on." After testing, disengage the safety and determine if the airsoft gun fires while the safety is being disengaged.

8.4.4.10 The airsoft gun passes the test if it did not fire when dropped with either the safety "on" or "off," did not fire when the safety was moved from the "on" to "off" position after being dropped, did not fire during the exposed hammer test and the manufacturer's recommended propellant cylinder remained in place (if one is used), and the safety remained "on" after being dropped with the safety "on."

8.5 *Trigger Pull Test:*

8.5.1 *Significance*—This method determines if the force required to pull the trigger to fire an airsoft gun is within the 1 to 16 lb (0.45 to 7.3 kg) range.

8.5.2 *Apparatus:*

8.5.2.1 A trigger weight system having a 1 ± 0.05-lb (0.45 ± 0.09-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 airsoft gun with the airsoft gun in a vertical position, muzzle up. (A spring gauge, capable of measuring the trigger force, can be used instead of the weight system.)

8.5.2.2 Manufacturer's operating instructions for the airsoft gun.

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

8.5.4 *Procedure:*

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

8.5.4.2 Conduct all tests without projectiles in the airsoft gun.

8.5.4.3 Cock or pump the airsoft gun.

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

8.5.4.5 Lift the airsoft gun slowly to lift the weight system by the trigger of the airsoft gun with the 1-lb (0.45-kg) weight in place. The airsoft gun should not fire.

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

8.5.4.7 Recock the airsoft gun and repeat the steps in 8.5.4.5 and 8.5.4.6 five times.

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

8.5.4.9 The airsoft gun passes if it lifts a 1-lb (0.45-kg) weight without firing, and fires during the application of the 16-lb (7.3-kg) weight.

8.6 *High Temperature Test:*

8.6.1 *Significance*—This method determines whether the structure of an airsoft gun powered by CO_2 will withstand 160 ± 5°F (71 ± 2.7°C) for ½ h without structural failure to the airsoft gun other than the seals.

8.6.2 *Apparatus:*

8.6.2.1 *Heating Device,* capable of being adjusted to a temperature of 160 ± 5°F (71 ± 2.7°C) and maintaining that temperature within ±10°F (± 5.4°C) for ½ h, and capable of safely withstanding the rupture of the cylinder, or airsoft gun or escape of CO_2 that may occur during the test.

8.6.2.2 *Scale,* capable of weighing full and empty cylinders having an accuracy of ±0.2 g.

8.6.3 *Test Specimens*—Test specimens shall consist of new airsoft guns powered by CO_2 and new CO_2 cylinders, selected in accordance with the manufacturer's usual quality assurance practices.

8.6.4 *Procedure (***Warning—***CO_2 cylinders may explode during the test procedure and caution should be taken by those conducting the test):*

8.6.4.1 Install the CO_2 cylinder in the airsoft gun, and fire five shots through the airsoft gun to ensure the airsoft gun is functioning properly. Remove the cylinder.

8.6.4.2 Weigh and record the weight of a new CO_2 cylinder. Install and pierce the cylinder in accordance with the manufacturer's operating instructions.

8.6.4.3 Place the airsoft gun with the installed and pierced CO_2 cylinder in the heating device and adjust the temperature to 160°F (71°C) and hold for ½ h.

8.6.4.4 Allow the airsoft gun and heating device to cool to a temperature that is safe to handle.

8.6.4.5 Remove the airsoft gun and cylinder from the heating device. Fire the airsoft gun until the CO_2 cylinder is empty.

8.6.4.6 Remove the cylinder from the airsoft gun. Weigh the CO_2 cylinder and calculate the weight of the CO_2 content in the original cylinder. Visually inspect the airsoft gun and cylinder for any damage.

8.6.4.7 Reload the airsoft gun with a new CO_2 cylinder and determine if the airsoft gun either fires properly or fails to fire.

8.6.4.8 The airsoft gun passes the test if it operated properly after the test or failed to fire altogether and no part separated from the airsoft gun (cracks are acceptable) and the CO_2 cylinder used in the 160°F (71°C) test originally held a minimum of 90 % of CO_2 by weight of capacity (for example, 10.8 g of CO_2 for the 12-g type CO_2 cylinder).

8.7 *Velocity Test:*

8.7.1 *Significance*—This method provides a procedure for determining the velocity of a projectile discharged from airsoft guns.

8.7.2 *Apparatus:*

8.7.2.1 *Manufacturer's Operating Instructions,* for the airsoft gun.

8.7.2.2 *Suitable Linear Measure,* for 5 ft (1.5m) and 3 ft (0.9 m).

8.7.2.3 *Sensing Devices,* two, and a counter with a range of 0.025 to 0.005 s with an accuracy of ±0.0001 s.

8.7.2.4 *Suitable Firing Range,* with backstop.

8.7.3 *Test Specimen*—The test specimen shall consist of a new airsoft gun and projectiles conforming to Specification F2679, which are recommended by the manufacturer for use in the airsoft gun. The airsoft gun, projectiles, and propellants are to be selected in accordance with the manufacturer's usual quality assurance practices.

8.7.4 *Procedure:*

8.7.4.1 Conduct the test at a temperature range of (60 to 80°F (16 to 27°C)).

8.7.4.2 Conduct the test with each type of projectile the airsoft gun is designed to use. Weigh the projectiles and record the average weight. Set the airsoft gun at its maximum recommended adjustable power setting. For airsoft guns using spring piston propulsion systems, a new airsoft gun shall be fired 100 times before measuring velocity.

8.7.4.3 Position the two sensing devices at the center-to center distance of 5 ± 0.05 ft (1.52 ± 0.02 m). Place a suitable backstop in line with and to the rear of the second sensing device. Connect the sensory devices to trigger the counter "on" when the projectile passes the first sensor and "off" when the projectile passes the second sensor.

8.7.4.4 With the distance of the muzzle of the airsoft gun to the first screen at 3 ft (0.9 m), discharge a projectile through both screens at the backstop. Fire ten shots with each airsoft gun. Record the time measurements for each shot.

8.7.4.5 Using the smallest observed time, compute the maximum velocity, V, as follows:

$$V = d/t \quad (1)$$

where:

V = velocity, ft/s (or m/s),
d = distance, 5 ft (or 1.52 m), and
t = time, s.

8.7.4.6 In the alternative, velocity can be determined following manufacturer's instructions for a properly calibrated chronograph, with sensing devices set 3 ft from the muzzle and otherwise in accordance with 8.7.4.

8.8 *Muzzle Energy Test:*

8.8.1 *Significance*—This method provides a procedure for determining the muzzle energy of a projectile expelled from an airsoft gun.

8.8.2 *Procedure:*

8.8.2.1 Conduct the velocity test in accordance with 8.7.

8.8.2.2 Using the maximum velocity of the airsoft gun, compute the muzzle energy, in Joules, as follows:

$$KE = 1/2\ MV^2 \quad (2)$$

where:

KE = muzzle energy,
M = mass of projectile expressed in kilos, and
V = velocity of projectile expressed in metres per second.

NOTE 2—Standards derived from NIST specifications.

9. Keywords

9.1 air soft; airsoft; airsoft BB; airsoft gun; airsoft projectile; low energy air gun