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Standard Consumer Safety Specification for Recreational Powered Scooters and Pocket Bikes¹

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INTRODUCTION

The U.S. Consumer Product Safety Commission (CPSC) staff is aware of 68 e-scooter related fatalities from 2017 to 2021. CPSC staff estimates a total of 117,600 e-scooter related emergency department (ED) visits from 2017 through 2021. Estimated ED visits increased from 7700 in 2017 to 42,200 in 2021. CPSC staff conducted 48 in-depth investigations related to e-scooters. The investigations described brake problems, fire hazards, unexpected power loss, users losing control, and environmental conditions.²

This consumer safety specification addresses incidents associated with recreational powered scooters and pocket bikes identified by the CPSC. In response to incident data compiled by the CPSC, this specification attempts to minimize the hazards identified by the CPSC. This specification is intended to cover normal use and reasonably foreseeable misuse or abuse of the product(s).

This specification is written within the current state-of-the-art of recreational powered scooters and pocket bikes technology and is intended to be updated whenever substantive information becomes available that necessitates additional requirements or justifies the revision of existing requirements.

1. Scope

1.1 This consumer safety specification establishes performance requirements, test methods and marking requirements to promote safe use of recreational powered scooters and pocket bikes intended for use by children age eight to twelve years, and adolescents age thirteen and above. This consumer safety specification is intended to minimize the risk of injury to an occupant from the normal use and reasonably foreseeable misuse of these e-mobility products.

1.2 For purposes of definition, a recreational powered scooter is a battery-powered motorized recreational vehicle that has two or more wheels, a low platform, a vertical element for the user to grasp, and a method of steering. Recreational powered scooters for children and adolescents are limited to speeds of 16 km/h (10 mph) or less for children age eight to twelve years, and adolescents age thirteen and above for fast-moving products capable of achieving speeds of 32 km/h (20 mph).

¹ This consumer safety specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.58 on Powered Scooters & Skateboards.

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² https://www.cpsc.gov/s3fs-public/Micromobility-Products-Related-Deaths-Injuries-and-Hazard-Patterns-2017-2021.pdf?VersionId=Zw1brSm70AOuwb4de8h1Vrn63Jx_SB.e

1.3 For purposes of definition, a pocket bike is a motorized two-wheel vehicle designed for a single occupant in the seated position typically designed to look like a motorcycle but scaled down to one quarter to one half the size of a typical motorcycle and not intended for use on public roads. Pocket bikes for children and adolescents are limited to speeds of 16 km/h (10 mph) or less for children age eight to twelve years, and adolescents age thirteen and above for fast-moving products capable of achieving speeds of 32 km/h (20 mph).

1.4 This consumer safety specification is not intended for:

1.4.1 Products designed and sold as “Adult Use Only” and are prominently labeled and marked as such;

1.4.2 Commercial electric-powered scooters (for example, shared or rented devices) for adults;

1.4.3 Bicycles tricycles;

1.4.4 Non-powered scooters (Consumer Safety Specification F2264);

1.4.5 Battery powered ride-on toys (Consumer Safety Specification F963);

1.4.6 Motorcycles, skateboards, all-terrain vehicles, go-karts (Practice F2007);

1.4.7 Concession go-karts;

1.4.8 Recreational and commercial fun-karts;

1.4.9 Snowmobiles, motorized trail bikes, lawn mowers, motorized wheelchairs including mobility scooters; or

1.4.10 Products designed or licensed for roadway use regulated by transportation regulations (such as those promulgated

by the U.S. Department of Transportation or similar state agencies or the National Highway Traffic Safety Administration).

1.5 This consumer safety specification is not intended to address incidents and injuries resulting from the interaction of other persons or objects with recreational powered scooters and pocket bikes and the user while these are in use.

1.6 No product covered by this specification produced after the approval date of this consumer safety specification shall, by label, marking, or other means, indicate compliance with this consumer safety specification unless it conforms to all requirements herein.

1.7 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.8 The following precautionary caveat pertains only to the test methods portion (Section 7) 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:³

- D3359 Test Methods for Rating Adhesion by Tape Test
- F963 Consumer Safety Specification for Toy Safety
- F2007 Practice for Design, Manufacture, and Operation of Concession Go-Karts and Facilities
- F2264 Consumer Safety Specification for Non-Powered Scooters

2.2 Federal Standards:⁴

- 16 CFR 1303 Lead Containing Paints
- 16 CFR 1500.48 Technical requirements for determining a sharp point in toys and other articles intended for use by children under 8 years of age
- 16 CFR 1500.49 Technical requirements for determining a sharp metal or glass edge in toys and other articles intended for use by children under 8 years of age

2.3 ANSI Standard:⁵

- ANSI/OPEI B71.1–1998 Consumer Turf Care Equipment
- ANSI Z535.1 Safety Colors

³ 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.

⁴ 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>.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>

2.4 UL Standards:⁶

- UL 2271 Standard for Batteries for Use in Light Electric Vehicle Application
- UL 2272 Standard for Electrical Systems for Personal E-Mobility Devices

2.5 SAE Standard:⁷

- SAE J3230/1_2021–02 Kinematic Performance Metrics for Powered Standing Scooters

2.6 IEC Standards:⁸

- IEC 62133-2 Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications
- IEC 50604-1 Secondary lithium batteries for light EV (electric vehicle) applications—Part 1: General safety requirements and test methods

2.7 International Protection Code (IPC) Standards:⁹

- IP67 Waterproof

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *accelerator system, n*—mechanical system that is used to control the throttle position.

3.1.2 *axle guard, n*—device that covers the drive axle so that the possibility of injury resulting from hand, hair, body parts, or loose clothing contacting the axle is reduced.

3.1.3 *conspicuous, adj*—visible when the product is assembled.

3.1.4 *deck, n*—generally, low horizontal platform upon which the user places one or both feet.

3.1.5 *deck plate, n*—form of guarding through the use of relatively flat barriers to cover rotating components.

3.1.6 *dynamic load, n*—force applied to an item by means of motion or impact.

3.1.7 *locking fastener, n*—includes prevailing torque locknuts, cotter pins, serrated surface lock nuts, pal nuts, safety wire, and similar hardware intended to prevent unintended loosening when properly used.

3.1.8 *manufacturer's recommended use position, n*—any position that is presented as a normal, allowable, or acceptable configuration for use of the product by the manufacturer in any descriptive or instructional literature; this specifically excludes conditions such as when the product is unassembled (completely or partially) or folded and positions that the manufacturer shows or explains as being unacceptable, unsafe, or not recommended.

3.1.9 *manufacturers recommended weight rating, n*—the maximum suggested load that the product can be subjected to during operation.

⁶ Available from Underwriters Laboratories (UL), UL Headquarters, 333 Pfingsten Road, Northbrook, IL, 60062, <http://www.ul.com>.

⁷ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

⁸ Available from International Electrotechnical Commission (IEC), 3, rue de Varembe, 1st floor, P.O. Box 131, CH-1211, Geneva 20, Switzerland, <https://www.iec.ch>.

⁹ Available from <https://www.iec.ch/ip-ratings>.

3.1.10 *motor stop switch, n*—toggle switch, or other two-position positively engaging switch, that, when activated, causes the motor to stop, not operate, or both.

3.1.11 *protective components, n*—specific items added to a product with the primary purpose of reducing a hazard such as sharp edges, entrapment holes, protrusions, and so forth; normally, these components cover or shield the area of the hazard.

3.1.12 *scooter, n*—vehicle that has two or more wheels, a low platform, a vertical element for the user to grasp, and a method of steering.

3.1.13 *sharp edges, n*—define per 16 CFR 1500.49.

3.1.14 *sharp points, n*—define per 16 CFR 1500.48.

3.1.15 *static load, n*—vertically downward load applied by a dead weight or other means.

3.1.16 *throttle stop, n*—device used to limit the travel of the throttle control.

4. General Requirements

4.1 All testing required by this consumer safety specification shall be conducted on the same unit in the order presented in this specification, except where directly indicated.

4.2 *Latching Devices*—Any product that folds shall have a latching device or other provision in the design that will prevent the product from unintentional folding when placed in the manufacturer's recommended use position. Latching devices for folding steering handles on scooters shall be tested in accordance with 7.8. During and upon completion of this test, the product shall remain latched in its manufacturer's recommended use position.

4.3 *Folding Mechanisms and Hinges*—These requirements are intended to eliminate possible crushing, laceration, or pinching hazards that might occur in folding mechanisms and hinges. Examples are the sudden collapse or unexpected motion of a folding mechanism or hinge that produces a scissor action; and the changing clearances at the hinge line between two hinged portions, such that the gap will admit fingers at any one position of the hinge but not at all positions. These requirements do not relate to the recognized and familiar hazards associated with the changing clearances around the edges of doors or pivoted or hinged sections.

4.3.1 *Folding Mechanisms*—Products which a folding mechanism, arm, or bracing is intended or likely to support the weight of a child in normal use shall have a locking device or other means to prevent unexpected or sudden movement or collapse of the product, or have adequate clearance to provide protection for the fingers, hands, and toes from crushing, laceration, or pinching hazards in the event of sudden movement or collapse of the product.

4.3.1.1 Locking devices or other means to prevent unexpected or sudden movement or collapse of the product shall engage automatically when the product is placed in the manufacturer's recommended use position. During and upon completion of the testing in 7.8, the product shall remain in its recommended use position. The test in 7.8 shall not apply to

locking devices or other means where the direction of force of the occupant load opposes the direction of collapse of the mechanism.

4.3.1.2 Locking devices shall comply with either of the following: (1) Each single-action device shall require a minimum force of 10 lbf (45 N) to activate the release mechanism when tested in accordance with 7.8; and (2) each double-action locking device shall require two distinct and separate actions to release. There are no force requirements for double-action locking devices.

4.4 *Hinge-Line Clearance*—Products having a gap or clearance along the hinge line between a stationary portion and a moveable portion that weighs more than ½ lb (0.2 kg) shall be so constructed that, if the accessible gap at the hinge line will admit a 3/16 in. (5 mm) diameter rod, it will also admit a ½ in. (13 mm) diameter rod at all positions of the hinge.

4.5 *Fasteners*—Fasteners used for wheel hubs, brake pivots, accelerator pivots, steering linkage pivots, axle attachments, and brush-bar attachments shall be locking fasteners.

4.6 *Paint*—Paint on all products shall comply with the lead content provisions of 16 CFR 1303.

4.7 *Material Quality*—Products shall be made from new or reprocessed materials and shall be visually clean and free from infestation. The materials shall be assessed visually by the unaided eye rather than under magnification.

4.8 *Molded Edges*—Accessible edges, corners, or mold-parting areas shall be free of hazardous edges produced by burrs and flash or so protected that hazardous edges are not exposed.

4.9 *Exposed Bolts or Threaded Rods*—If the ends of more than three threads on bolts or threaded rods are accessible, the ends shall be covered by smooth finish caps.

4.10 *Accessible Points*—Products shall not have accessible potentially hazardous sharp points that may occur because of the following: configuration, assembly devices that are fastened poorly, poorly sheared sheet metal, burrs on screws, and splintered wood. Products that are intended to be assembled by an adult and contain potentially hazardous sharp points in the unassembled state shall be so labeled.

4.11 *Accessible Edges*—Products shall not have accessible, potentially hazardous sharp edges. Products that are intended to be assembled by an adult and may contain unprotected potentially hazardous sharp edges in the unassembled state shall be so labeled.

4.12 *Labels and Warning Labels:*

4.12.1 Labels and warning labels shall be tested per 7.10 and 7.11.

4.12.2 All labels, warnings, and instructions are to meet all requirements of this consumer safety specification.

5. Calibration and Standardization Requirements

5.1 Before testing, the new, unused units shall be completely assembled, unless otherwise noted, in accordance with the manufacturer's instructions.

5.2 The initial vehicle conditions shall be in accordance with SAE J3230/1_2021-02.

5.3 All testing required by this safety specification shall be conducted on the same unit unless otherwise specified.

5.4 All exposed parts shall be smooth and free of splinters, spurs, burrs, sharp edges, and sharp points.

5.5 The product to be tested shall be at an ambient temperature of $73\text{ }^{\circ}\text{F} \pm 9\text{ }^{\circ}\text{F}$ ($23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$) for at least 1 h before testing. All testing shall be conducted in this temperature range.

6. Performance Requirements

6.1 Brakes:

6.1.1 Units shall include at least one mechanical brake or hydraulic brake.

6.1.2 The operation of the brake shall not be dependent on the operation of the electrical system.

6.1.3 Units shall meet the dynamic brake test specified in 7.2.

6.1.4 Hand brake levers shall be located on the handlebars in a position that is readily accessible to the rider in the recommended use position.

6.1.5 Hand brake levers located on the left side of the handlebars shall actuate the front brake while hand brake levers located on the right side of the handlebars shall actuate the rear brake.

6.1.6 If there is only one handbrake, the throttle and hand brake lever shall be located on opposite sides of the handlebar.

6.1.7 Hand brake levers shall have a maximum reach (dimension between the hand brake lever(s) and the handlebars) of not more than 89 mm (3.5 in.) at any point between the pivot point of the lever and the lever midpoint.

6.1.8 At no point along the lever shall the grip dimension exceed 102 mm (4 in.).

6.1.9 An operating force of equal to or less than 44.5 N (10 lbf) applied to the hand lever at a point 25 mm (1.0 in.) from the open end of the hand lever shall cause the brake to begin its retarding function

6.2 Electrical Systems:

6.2.1 If vented batteries are used, they shall have a vent tube, which is pointed downwards and extends below the bottom of the battery. The battery end of the vent tube shall be attached securely to the battery. The drain end of the vent tube shall be secured within 25 mm (1 in.) of the end of the tube. All positively charged electrical connections shall have insulated coverings.

6.2.2 If lithium-ion battery packs are used, they shall conform to the requirements outlined in UL 2271, as well as IEC 62133-2 or IEC 50604-1.

6.2.3 All e-mobility products within the scope of this safety specification shall conform to the requirements outlined in UL 2272.

6.2.4 All battery packs shall be protected from dust and water ingress, adhering to International Protection Code (IPC) rating of IP67.

6.2.5 Units that are designed for children eight to twelve years shall not exceed 36 V nominal.

6.2.6 Chargers shall be certified and marked by an appropriate nationally recognized testing laboratory.

6.2.7 Unit shall have charger connect-interlock so that the unit cannot be activated when the charger is plugged in.

6.2.8 Controllers shall have the following protections:

6.2.8.1 Hand brake activation shall cut off positive torque power to the motor.

6.2.8.2 *Field-Effect Transistor (FET) Short Sensing*—Controller shall be able to compare power transistor versus speed controller/throttle to prevent any power to the motor if and when the FET is shorted.

6.2.9 Resettable circuit breakers or fuses shall be used to protect the system.

6.3 *Curb Impact Tests*—Units shall be tested per 7.1.

6.4 *Plastics*—Exposed components made of plastic shall have an ultraviolet (UV) inhibitor.

6.5 Shields and Guards:

6.5.1 Does not apply to spoked wheels and disk brakes.

6.5.2 Guards for rotating components shall be permitted to have multiple holes each no larger than 32 mm^2 (0.05 in.²) area.

6.5.3 All guards and shields for pulleys and sprockets shall be secured permanently or attached to prevent their removal from the product without tools. The fasteners for those guards and shields shall be reusable.

6.5.4 The entry and exit points on and off of the sprockets or pulleys of drivetrains (chain and sprocket or belt and pulley) and open running chain and belt sections shall be covered on top and outwardly to prevent inadvertent touching from a normal riding position. A section of the rear sprocket or pulley drive may be exposed to facilitate the inspection and maintenance of the drivetrain. The inside and bottom may be exposed. The drivetrain is not exempt from the finger-probe standard, but the probe (Fig. 1) shall be applied at angles relative to the normal riding position and not applied from rearward or underneath positions. A specific drivetrain warning shall be permanently engraved, stamped, or applied to the guard. A warning shall be included that reads “WARNING—Keep away from moving parts” or equivalent.

6.6 *Dynamic Strength*—All products shall be tested per 7.3.

6.7 *Static Strength*—All products shall meet the static strength test specified in 7.4.

6.8 Following the dynamic strength and static strength tests, the unit shall meet all of the following requirements:

6.8.1 Free from visible deformation of any parts that are the primary focus of testing;

6.8.2 Wheels and tires shall not hinder any part of the scooter including rubbing;

6.8.3 All parts shall function as the manufacturer intended; and

6.8.4 No fluid leaks.

6.9 *Wheel Retention*—All products shall meet the wheel retention test specified in 7.9.

6.10 *Grip Retention*—All products shall meet the grip retention test specified in 7.4.2.

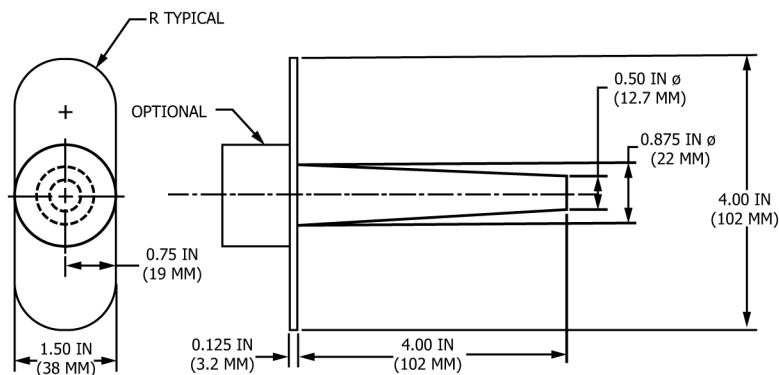


FIG. 1 Finger Probe

6.11 *Handle Stem*—All products shall meet the handle stem tests specified in 7.6 and 7.7.

6.12 *Dynamic Brake Test*—All products shall meet the dynamic brake test specified in 7.2.

7. Test Methods

7.1 *Curb Impact Test:*

7.1.1 Apply a weight to the center of the product equivalent to the manufacturer's specified upper weight limit.

7.1.2 Drive the scooter into a high vertical fixed curb that is at least the radius height of the wheel at 2 m/s (6.6 ft/s).

7.1.3 Repeat 7.1.2 for a total of three times.

7.1.4 Following the impact tests, the product shall be completely functional.

7.2 *Dynamic Brake Test:*

7.2.1 A unit shall be tested with a rider of at least 68.1 kg (150 lb) weight and shall have a stopping distance of no greater than 4.57 m (15 ft) from an actual test speed of 16 km/h (10 mph) or greater as determined by the equivalent ground speed specified in 7.2.2.

7.2.2 The following test conditions shall be followed:

7.2.2.1 The product shall be ridden over a dry, clean, smooth paved test course free from protruding aggregate. The test course shall provide a coefficient of friction of less than 1.0 and shall have a slope of less than 1 %.

7.2.2.2 The wind velocity shall be less than 11 km/h (7 mph).

7.2.2.3 The product shall attain the specified ground speed while the rider is in the normal riding position.

7.2.2.4 The rider shall remain in the normal riding position throughout the test.

7.2.2.5 The product must be moving in a straight line at the start of the brake application.

7.2.2.6 Corrections for velocity at the initiation of braking may be made. The corrected braking distance shall be computed as follows:

$$S_c = (V_s / V_m)^2 S_m \quad (1)$$

where:

S_c = corrected braking distance,
 V_s = specified test velocity,
 V_m = measured test velocity, and
 S_m = measured braking distance.

(1) The test run is invalid if at the commencement of the test, the measured test speed of the product is not less than nor greater than the test speed required by 1.5 km/h (0.9 mph).

7.2.2.7 Four test runs are required. The stopping distance shall be determined by averaging the results of the four test runs.

7.2.2.8 The stopping distances specified are based on a rider weight of at least 68.1 kg (150 lb) and a maximum rider and product weight combination of 91 kg (200 lb). Greater stopping distances are allowable for heavier riders and test equipment weights at the rate of 0.30 m per 4.5 kg (1.0 ft per 10 lb).

7.2.2.9 A test run is invalid if wheel lockup occurs.

7.3 *Dynamic Strength Test:*

7.3.1 Apply a weight to the deck or seat of the product equivalent to the manufacturer's specified upper weight limit.

7.3.2 Drop the product such that the front wheel(s) is 150 mm (6 in.) from the surface and the rear wheel(s) is 300 mm (12 in.) from the surface. The surface shall consist of vinyl tile over concrete.

7.3.3 Repeat the step in 7.3.2 for a total of three times.

7.3.4 Repeat the steps in 7.3.2 and 7.3.3 for the opposite wheel.

7.4 *Static Strength Test:*

7.4.1 For products without a seating surface, apply a static load of three times the manufacturer's maximum specified weight limit to a nominal 150 mm by 150 mm by 50 mm (6 in. by 6 in. by 2 in.) wooden block centered between the front and rear axles of the product's deck and centered axially. For products with a seating surface, apply a static load of three times the manufacturer's maximum specified weight limit to a nominal 150 mm by 150 mm by 50 mm (6 in. by 6 in. by 2 in.) wooden block centered the product's seating surface. Products that have multiple recommended use positions shall be tested (1) with the seat off and (2) with the seat on and mounted in the adjustment position (if any are provided) deemed most likely to cause a failure. Apply the load gradually over a period of 5 s and maintain for 30 s.

7.4.2 *Grip Retention Test/Handle Retention Test*—Apply 67 N (15 lbf) to the grips along the axis of the handlebar gradually over a period of 5 s and maintain for 10 s. If the grip is removed from the handlebar as a result of the loading, it fails this test.