

# ELECTRONIC CODE OF FEDERAL REGULATIONS

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Title 16: Commercial Practices

[PART 1512—REQUIREMENTS FOR BICYCLES](#)

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## Subpart A—Regulations

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### §1512.1 Scope.

This part sets forth the requirements for a bicycle as defined in §1512.2(a) (except “one-of-a-kind bicycle” as defined in §1512.2 (d) and (e)) which is not a banned article

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## §1512.2 Definitions.

For the purposes of this part:

(a) Bicycle means:

(1) A two-wheeled vehicle having a rear drive wheel that is solely human-powered

(2) A two- or three-wheeled vehicle with fully operable pedals and an electric motor with a maximum speed on a paved level surface, when powered solely by such a motor while the operator is seated, of less than 20 mph.

(b) *Sidewalk bicycle* means a bicycle with a seat height of no more than 635 mm (25 inches) when the seat is adjusted to its highest position. Recumbent bicycles are not included in this definition.

(c) *Seat height* means the dimension from the point on the seat surface immediately above the center of the seating area if no seat post exists) and the ground plane, as measured with the rider seated and normal to the ground plane.

(d) *Track bicycle* means a bicycle designed and intended for sale as a competitive racing bicycle, with no fenders or fender stays, single crank-to-wheel ratio, and no free-wheeling feature between the pedals and the rear wheel.

(e) *One-of-a-kind bicycle* means a bicycle that is uniquely constructed to the order of a customer, using assembly of stock or production parts.

(f) *Normal riding position* means that the rider is seated on the bicycle with both feet on the pedals and in a position that allows operation of handbrake levers if so equipped, with the handlebars adjusted to positions judged by the rider to be comfortable.

(g) *Recumbent bicycle* means a bicycle in which the rider sits in a reclined position with the pedals in front of the seat.

[43 FR 60034, Dec. 22, 1978, as amended at 68 FR 7073, Feb. 12, 2003; 76 FR 27888, May 11, 2011]

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## §1512.3 Requirements in general.

Any bicycle subject to the regulations in this part shall meet the requirements of this section when offered for sale to consumers; any bicycle offered for sale to consumers in disassembled form shall meet these requirements after assembly according to the manufacturer's instructions. In this section, where the metric and English units are not equal due to the conversion process, the metric unit shall prevail.

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## §1512.4 Mechanical requirements.



(a) *Assembly*. Bicycles shall be manufactured such that mechanical skills required exceed those possessed by an adult of normal intelligence and ability.

(b) *Sharp edges*. There shall be no unfinished sheared metal edges or other sharp may be, exposed to hands or legs; sheared metal edges that are not rolled shall be finished edges, or any burrs or spurs caused during the shearing process.

(c) *Integrity*. There shall be no visible fracture of the frame or of any steering, wheel component resulting from testing in accordance with: The handbrake loading and performance test, §1512.18(e); and the road test, §1512.18(p) (or the side swing test).

(d) *Attachment hardware*. All screws, bolts, or nuts used to attach or secure components shall otherwise fail their intended function during the tests required in this part. All threaded fasteners shall allow adjustments and maintenance. Recommended quality thread form is specified in Standards for Federal Service,"<sup>1</sup> issued by the National Bureau of Standards, Department of Commerce. Mechanical properties are specified in ISO Recommendation R898, "Mechanical Properties of Screws with General Purpose Thread," Recommendations 68, 262, and 263, "General Purpose Screw Threads."<sup>2</sup>

<sup>1</sup>Copies may be obtained from: Superintendent of Documents, U.S. Government Printing Office.

<sup>2</sup>Copies may be obtained from: American National Standards Institute, 1430 Broadway, New York, NY 10018.

(e)-(f) [Reserved]

(g) *Excluded area*. There shall be no protrusions located within the area bounded by: (1) a line parallel to the handlebar stem; (2) a line tangent to the front tip of the seat and intersecting the handlebar stem; (3) the top surface of the top tube; and (4) a line connecting the front of the seat (or the junction where the handlebar is attached to the handlebar stem). The top tube on a diamond frame and the down tube or tubes that are nearest the rider in the normal riding position shall have a minimum wall thickness of 1/16 in (1.6 mm) in diameter and cable clamps made from material not thicker than 4.8 mm (3/16 in).

(h) [Reserved]

(i) *Control cable ends*. Ends of all accessible control cables shall be provided with caps to prevent unraveling. Protective caps shall be tested in accordance with the protective cap test, §1512.18(c), and shall withstand a pull of 8.9 N (2.0 lbf).

(j) *Control cable abrasion*. Control cables shall not abrade over fixed parts and shall be routed in a direction in line with the sheath entrance and exit so as to prevent abrading.

[43 FR 60034, Dec. 22, 1978, as amended at 76 FR 27888, May 13, 2011]

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## **§1512.5 Requirements for braking system.**

(a) *Braking system.* Bicycles shall be equipped with front- and rear-wheel brakes c

(b) *Handbrakes.* Handbrakes shall be tested at least ten times by applying a force contact the handlebar, or a maximum of 445 N (100 lbf), in accordance with the loading rocked back and forth with the weight of a 68.1 kg (150 lb) rider on the seat with the sa accordance with the rocking test, §1512.18(d)(2)(iii); there shall be no visible fractures, misalignment of brake components.

(1) *Stopping distance.* A bicycle equipped with only handbrakes shall be tested for 68.1 kg (150 lb) weight in accordance with the performance test, §1512.18(d)(2) (v) an of no greater than 4.57 m (15 ft) from the actual test speed as determined by the equiv (d)(2)(vi).

(2) *Hand lever access.* Hand lever mechanisms shall be located on the handlebar the rider when in a normal riding position.

(3) *Grip dimension.* The grip dimension (maximum outside dimension between the the plane containing the centerlines of the handgrip and the hand brake lever) shall no between the pivot point of the lever and lever midpoint; the grip dimension for sidewalk The grip dimension may increase toward the open end of the lever but shall not increa for the last 12.7 mm (  $\frac{1}{2}$  in) of the lever. (See figure 5 of this part 1512.)

(4) *Attachment.* Brake assemblies shall be securely attached to the frame by mea as a lock washer, locknut, or equivalent and shall not loosen during the rocking test, § shall not cut any of the cable strands.

(5) *Operating force.* A force of less than 44.5 N (10 lbf) shall cause the brake pads wheel when applied to the handlever at a point 25 mm (1.0 in) from the open end of the

(6) *Pad and pad holders.* Caliper brake pad shall be replaceable and adjustable to contacting the tire or spokes and the pad holders shall be securely attached to the cali shall be retained in its holder without movement when the bicycle is loaded with a rider rocked forward and backward as specified in the rocking test, §1512.18(d)(2)(iii).

(7) [Reserved]

(8) *Hand lever location.* The rear brake shall be actuated by a control located on tl shall be actuated by a control located on the left handlebar. The left-hand/right-hand lo with an individual customer order. If a single hand lever is used to actuate both front ar requirements for hand levers and shall be located on either the right or left handlebar i preference.

(9) *Hand lever extensions.* Bicycles equipped with hand lever extensions shall be and the hand lever extensions shall also be considered to be hand levers.



(1) *Stopping distance.* Bicycles equipped with footbrakes (except sidewalk bicycle performance test, §1512.18(e)(3), by a rider of at least 68.1 kg (150 lb) weight and shall be tested from an actual test speed of at least 16 km/h (10 mph). If the bicycle's groundspeed of the bicycle is in excess of 24 km/h (15 mph) (in its highest gear ratio at the time of the test),<sup>3</sup> the stopping distance shall be 4.57 m (15 ft) from an actual test speed of 24 km/h (15 mph).

(2) *Operating force.* Footbrakes shall be actuated by a force applied to the pedal in excess of 150 pounds (68 kg) of force, except where brakes are separate from the drive pedals and the applied force is

(4) *Independent operation.* The brake mechanism shall function independently of :

(e) *Sidewalk bicycles.* (1) Sidewalk bicycles shall not have handbrakes only.

(3) Sidewalk bicycles with a seat height less than 560 mm (22 in) (with seat height measured with the seat at its highest position) shall be equipped with a brake. Such sidewalk bicycles equipped with a brake shall not have a freewheel feature. Such sidewalk bicycles equipped with a brake shall be tested to meet the minimum brake force in accordance with the sidewalk bicycle footbrake force test, §1512.18(f). Such bicycles shall be identified with a permanent label clearly visible from a distance of 3.1 m (10 ft) when the bicycle is in its upright position. Promotional display material and shipping cartons shall prominently display the words 'Minimum Brake Force' and the minimum brake force value in newtons (N) and pounds force (lbf).

### §1512.6 Requirements for steering system.

<https://www.ecfr.gov/cgi-bin/text-idx?SID=9127d5065057f0f944033480d8a48a41&mc=t...> 07/03/2018



(b) *Handlebar stem strength.* The handlebar stem shall be tested for strength in accordance with §1512.18(g), and shall withstand a force of 2000 N (450 lbf) for bicycles and 1000 N (225 lbf) for motorcycles.

(c) *Handlebar.* Handlebars shall allow comfortable and safe control of the bicycle. The handlebars shall be located with respect to the longitudinal axis of the bicycle and no more than 406 mm (16 in) from the seat is in its lowest position and the handlebar ends are in their highest position. This requirement applies to all bicycles.

(d) *Handlebar ends.* The ends of the handlebars shall be capped or otherwise covered. Shifters, or other end-mounted devices shall be secure against a removal force of no less than 225 N (50 lbf) with the protective cap and end-mounted devices test, §1512.18(c).

(e) *Handlebar and clamps.* The handlebar and clamps shall be tested in accordance with the directions for assembly of the bicycle required in the instruction manual by §1512.19(a) about the danger of damaging the stem-to-fork assembly and the risk of injury to the rider from a loose stem bolt or other clamping device. The directions for assembly shall also contain a safety procedure to be followed to avoid damaging the stem-to-fork assembly when tightening the clamps.

[43 FR 60034, Dec. 22, 1978, as amended at 76 FR 27888, May 13, 2011]

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### **§1512.7 Requirements for pedals.**

(a) *Construction.* Pedals shall have right-hand/left-hand symmetry. The tread surface shall be on the bottom surfaces of the pedal except that if the pedal has a definite preferred position, the tread surface shall be presented to the rider's foot.

(b) *Toe clips.* Pedals intended to be used only with toe clips shall have toe clips secured to the pedal. Pedals designed for optional use of toe clips shall have tread surface on the bottom surfaces.

(c) *Pedal reflectors.* Pedals for bicycles other than sidewalk bicycles shall have reflectors. Pedals for sidewalk bicycles are not required to have reflectors.

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### **§1512.8 Requirements for drive chain.**

The drive chain shall operate over the sprockets without catching or binding. The chain shall withstand a force of no less than 8010 N (1,800 lbf) or 6230 N (1,400 lbf) for sidewalk bicycles.

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### **§1512.9 Requirements for protective guards.**

(a) *Chain guard.* Bicycles having a single front sprocket and a single rear sprocket shall have a chain guard that covers the top strand of the chain and at least 90° of the perimeter where the drive chain contacts the sprockets.

7. The chain guard shall extend rearward to a point at least 8 cm (3.2 in.) forward of the minimum width of the top area of the chain guard shall be twice the width of the chain rim. The rear part of the top area may be tapered. The minimum width at the rear of the Such chain guard shall prevent a rod of 9.4 mm ( $\frac{3}{8}$  in.) diameter and 76 mm (3.0 in.) l upper junction of the chain and the sprocket when introduced from the chain side of the a line normal to the sprocket.

(b) *Derailleur guard.* Derailleurs shall be guarded to prevent the drive chain from hitting the wheel through improper adjustments or damage.

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### **§1512.10 Requirements for tires.**

The manufacturer's recommended inflation pressure shall be molded into or onto the tire at least 3.2 mm ( $\frac{1}{8}$  in.) in height. The statement of recommended inflation pressure shall be in Arabic numerals. (The following language is suggested to indicate recommended inflation to 110 percent of the recommended inflation pressure, the tire shall remain intact when tested under a load of 2,000 N (450 lbf) in accordance with the rim test, §1512.18(j). Tires and nonmolded wired-on tires are exempt from this section.

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### **§1512.11 Requirements for wheels.**

(a) *Spokes.* There shall be no missing spokes.

(b) *Alignment.* The wheel assembly shall be aligned such that no less than 1.6 mm clearance exists between the tire and fork or any frame member when the wheel is rotated to any position.

(c) *Rims.* Rims shall retain the spokes and tire when side-loaded with 2000 N (450 lbf) in accordance with the rim test, §1512.18(j). Sidewalk bicycles need not meet this requirement.

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### **§1512.12 Requirements for wheel hubs.**

All bicycles (other than sidewalk bicycles) shall meet the following requirements:

(a) *Locking devices.* Wheels shall be secured to the bicycle frame with a positive locking device. Axles shall be tightened to the manufacturer's specifications.

(1) *Rear wheels.* There shall be no relative motion between the axle and the frame when a force is applied symmetrically to the axle for a period of 30 seconds in the direction of wheel rotation.

(2) *Front wheels.* Locking devices, except quick-release devices, shall withstand a torque of removal of 17 N-m (12.5 ft-lb).



(b) *Quick-release devices.* Lever-operated, quick-release devices shall be adjustable tightness. Quick-release levers shall be clearly visible to the rider and shall indicate when unlocked position. Quick-release clamp action shall emboss the frame or fork when locked.

(c) *Front hubs.* Front hubs not equipped with lever-operated quick-release devices shall be tested in accordance with the front hub retention test, §1512.18(j)(3), to assure that when released the wheel will not separate from the fork.

[43 FR 60034, Dec. 22, 1978, as amended at 76 FR 27888, May 13, 2011]

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### **§1512.13 Requirements for front fork.**

The front fork shall be tested for strength by application of at least 39.5 J (350 in-lb) of energy, without visible evidence of fracture. Sidewalk bicycles need not meet this test, §1512.18(k)(1).

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### **§1512.14 Requirements for fork and frame assembly.**

The fork and frame assembly shall be tested for strength by application of a load (in-lb) of energy, whichever results in the greater force, in accordance with the frame test, §1512.18(l), without visible evidence of fracture or frame deformation that significantly limits the steering angle over the steering range. Sidewalk bicycles are exempt from this section.

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### **§1512.15 Requirements for seat.**

(a) *Seat limitations.* No part of the seat, seat supports, or accessories attached to the seat shall project more than 2 inches above the top of the seat surface at the point where the seat surface is intersected by a vertical line. This requirement does not apply to recumbent bicycles.

(b) *Seat post.* The seat post shall contain a permanent mark or ring that clearly indicates the maximum seat-height adjustment; the mark shall not affect the structural integrity of the seat post and shall be located no less than two seat-post diameters from the lowest point on the post shaft, and the post shall have a length of one shaft diameter below the mark. This requirement does not apply to recumbent bicycles; however, a permanent mark or other means to clearly indicate that the seat or seat post is adjustable is required.

(c) *Adjustment clamps.* The seat adjustment clamps shall be capable of securing the seat to the seat post and preventing movement of the seat in any direction under normal conditions. When subjected to the seat adjustment clamp and load test, §1512.18(l), the seat shall not move more than 1/4 inch.

[43 FR 60034, Dec. 22, 1978, as amended at 76 FR 27888, May 13, 2011]



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### §1512.16 Requirements for reflectors.

Bicycles shall be equipped with reflective devices to permit recognition and identification of vehicle headlamps. The use of reflector combinations off the center plane of the bicycle is acceptable if each reflector meets the requirements of this section and of §1512.18 (m). Each reflector has a clear field of view of  $\pm 10^\circ$  vertically and  $\pm 50^\circ$  horizontally. Sidewalk bicycles.

(a) *Front, rear, and pedal reflectors.* There shall be an essentially colorless front-facing reflector, amber pedal reflectors, and a red rear-facing reflector.

(b) *Side reflectors.* There shall be retroreflective tire sidewalls or, alternatively, reflective wheel, or, for non-caliper rim brake bicycles, retroreflective wheel rims. The center of each sidewall shall be 76 mm (3.0 in.) of the inside of the rim. Side reflective devices shall be visible on each

(c) *Front reflector.* The reflector or mount shall not contact the ground plane when the bicycle is in the upright orientation. The optical axis of the reflector shall be directed forward within  $5^\circ$  of the horizontal when the wheels are tracking in a straight line, as defined in §1512.18(m)(2). The reflector shall be a distinct, preferred assembly method that shall insure that the reflector meets the optical requirements of this paragraph (c) when the reflector is attached to the bicycle. The front reflector shall be tested in accordance with the reflector mount and alignment test, §1512.18(m).

(d) *Rear reflector.* The reflector or mount shall not contact the ground plane when the bicycle is in the upright orientation. The reflector shall be mounted such that it is to the rear of the seat mast (3.0 in) below the point on the seat surface that is intersected by the line of the seat post. The optical axis shall be directed rearward within  $5^\circ$  of the horizontal-vertical alignment of the bicycle when the bicycle is in the upright position, as defined in §1512.18(m)(2). The reflectors and/or mounts shall incorporate a distinct assembly method that shall insure that the reflector meets the optical requirements of this paragraph (d) when the rear reflector shall be tested in accordance with the reflector mount and alignment test.

(e) *Pedal reflectors.* Each pedal shall have reflectors located on the front and rear surfaces. The reflector elements may be either integral with the construction of the pedal or mechanically attached to the pedal from the edge of the pedal, or of the reflector housing, to prevent contact of the reflector with the edge of the pedal.

(f) *Side reflectors.* Reflectors affixed to the wheel spokes shall be mounted either in a cage such that the angle between the optical axis and the normal to the plane of the wheel spokes with the plane of the wheel. The reflectors shall not interfere with any wheel adjustment devices. Side reflective devices shall be essentially colorless or amber on the front wheel and essentially colorless or red on the rear wheel.

(g) *Reflector tests.* The pedal, front-mount, rear-mount, and side-mount reflectors shall be tested in accordance with the reflector test, §1512.18(n), to assure the reflectance values over the angles given in table 1.

(h) *Retroreflective tire sidewalls.* When retroreflective tire sidewalls are used in lieu of reflective material, the reflective material shall meet the following requirements:



(1) The retroreflective material shall form a continuous circle on the sidewall.

(2) The retroreflective material shall adhere to the tire such that after the tire has been subjected to 122° ±5.4 °F for 30 minutes, the retroreflective material cannot be peeled or scraped off.

(3) The retroreflective material shall be as resistant to abrasion as is the adjacent material. When the retroreflective material is removed from the inflated tire by abrasion with a wet, steel brush, the retroreflective material shall be removed along with the retroreflective material.

(4) The retroreflective material shall be tested for performance in accordance with the procedure in table 3. When a portion of the retroreflective material is removed (and the remainder is masked as specified in §1512.18(o)(2)(i)), the selected portion of the assembled bicycle is resting on that plane in any orientation.

(i) *Retroreflective rims.* When retroreflective rims are used in lieu of spoke-mounted sidewalls, the reflecting material shall meet the following requirements:

(1) The retroreflective material shall form a continuous circle on the rim.

(2) If the retroreflective material is applied to the rim in the form of a self-adhesive tape, use a sharp knife, razor blade, or similar instrument to carefully release an end of the tape. Grasp the freed tape end and gradually pull it away from the rim. The tape material must break before additional separation (peeling) from the rim is observed.

(3) After the retroreflective material is abraded in accordance with the abrasion test, the rim must then be tested for performance in accordance with the retroreflective tire test. The retroreflective material shall exhibit reflectance properties over the angles given in table 3.

[43 FR 60034, Dec. 22, 1978, as amended at 45 FR 82627, 82628, Dec. 16, 1980]

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### **§1512.17 Other requirements.**

(a) *Road test.* Bicycles, other than sidewalk bicycles, shall be ridden at least 6.4 km (4 mi) at a speed of 16 km/h (10 mph) and travel five times over a 30.5 m (100 ft.) cleared course in accordance with the procedure in table 3. The bicycle shall exhibit stable handling, turning, and steering characteristics without difficulty of or component failure of the structure, brakes, or tires, and there shall be no loosening or damage to the controls, or reflectors during or resulting from this test.

(b) *Sidewalk bicycle proof test.* Sidewalk bicycles shall be dropped a distance of 1.8 m (6 ft.) from a paved surface with weights attached in accordance with the sidewalk bicycle proof test in table 3. The bicycle shall not be damaged to the wheels, frame, seat, handlebars, or fork during or resulting from this test.

(c) *Ground clearance.* With the pedal horizontal and the pedal crank in its lowest position, it shall be possible to tilt the bicycle at least 25° from the vertical without the pedal or any part of the bicycle touching the ground plane.



(d) *Toe clearance.* Bicycles not equipped with positive foot-retaining devices (such as  $3\frac{1}{2}$  in) clearance between the pedal and the front tire or fender (when turned to any position measured forward and parallel to the longitudinal axis of the bicycle from the center of the pedal or fender, whichever results in the least clearance. (See figure 6 of this part 1512.)

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#### **§1512.18 Tests and test procedures.**

(a) *Sharp edge test.* [Reserved]

(b) [Reserved]

(c) *Protective cap and end-mounted devices test.* (Ref. §1512.4(i), §1512.6(d).) A force of at least 67 N (15 lbf) for protective caps and 8.9 N (2.0 lbf) for end caps at any point. All protective caps and end-mounted handlebar devices shall be tested to determine the effect of application of the specified forces.

(d) *Handbrake loading and performance test:* (Ref. §1512.5(b)).

(1) *Apparatus.* A spring scale or other suitable device for measuring the specified force on a dry, clean, level, paved surface of adequate length.

(2) *Procedure.* The loading test, §1512.18(d)(2)(i), and the rocking test, §1512.18(d)(2)(ii), performance test, §1512.18(d)(2)(v), is performed and no adjustments shall be made to the test.

(i) *Loading test procedure.* The hand levers shall be actuated with a force applied from the open end of the lever. If the hand lever contacts the handlebar (bottoms) before the loading may be stopped at that point, otherwise the loading shall be increased to a loading force shall be repeated for a total of 10 times and all brake components shall be tested.

<sup>4</sup>For hand lever extensions, the loading shall be continued until a force of 445 N (100 lbf) is applied in the same plane as the upper surface of the handlebars or the extension lever contacts the handlebar.

(ii) *Loading test criteria.* There shall be no visible fractures, failures, misalignments, or other inapplicable parts of §1512.5.

(iii) *Rocking test procedure.* A weight of at least 68.1 kg (150 lb) shall be placed on the handlebars to contact the handlebars or 445 N (100 lbf), as determined in §1512.18(d)(2), so that the bicycle shall be rocked forward and backward over a dry, clean, level, paved surface at least 76 mm (3 in) in each direction.

(iv) *Rocking test criteria.* There shall be no loosening of the brake pads, pad holder devices or any other functional brake component.

(v) *Performance test procedure.* The following test conditions, unless otherwise specified, shall be followed:

(A) The bicycle shall be ridden over a dry, clean, smooth paved test course free from oil, water, or other slippery substances, and shall provide a coefficient of friction of less than 1.0 and shall have a slope of less than 1 percent.

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

(C) Only the brake system under test shall be actuated.

(D) The bicycle shall attain the specified ground speed while the rider is in the normal riding position.

(E) The rider shall remain in the normal riding position throughout the test.

(F) The bicycle must be moving in a straight line at the start of brake application.

(G) Corrections for velocity at the initiation of braking may be made. The corrections shall be as follows:

$$S_c = (V_s / V_m)^2 S_m$$

where:

$S_c$  = Corrected braking distance,

$V_s$  = Specified test velocity.

$V_m$  = Measured test velocity,

$S_m$  = Measured braking distance.

The test run is invalid if at the commencement of the test, the measured test speed is less than the test speed required by this part 1512 by 1.5 km/h (0.9 mph).

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

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

(J) A test run is invalid if front-wheel lockup occurs.

(vi) *Performance test criteria.* The stopping force applied to the hand lever at a point 100 mm from the open end shall not exceed 178 N (40 lbf). Bicycles with an equivalent ground speed in the highest gear ratio at a pedal crank rate of 60 revolutions per minute<sup>3</sup> shall stop from a specified speed or greater within a distance of 4.57 m (15 ft); when the equivalent ground speed is less than the specified speed, the bicycle shall stop from an actual test speed of 16 km/h (10 mph) or greater.

<sup>3</sup>See footnote 3 to §1512.5.

(e) *Footbrake force and performance test.* (Ref. §1512.5(c) (1) and (2)):



(1) *Apparatus*. Suitable devices for exerting and measuring the required forces and adequate length.

(2) *Force test*. The braking force shall be measured as the wheel is rotated in a direction tangential to the tire during a steady pull after the wheel before the wheel completes one revolution. The brake shall be capable of producing a gradually applied pedal force from 89 N to 310 N (20 to 70 lbf) and shall not be less than the force of 310 N (70 lbf). All data points must fall within plus or minus 20 percent of the load using the least square method of obtaining the best straight line curve.

(3) *Performance test*. The procedure of §1512.18(d)(2)(v) shall be followed to test distance shall be less than 4.57 m (15 ft) from an actual test speed of 16 km/h (10 mph) speed of the bicycle is in excess of 24 km/h (15 mph) (in its highest gear ratio at a pedal minute),<sup>3</sup> the stopping distance shall be 4.57 m (15 ft) from an actual test speed of 24 km/h.

NOTE: No allowance shall be made for rider weight. See §1512.5(d) for additional requirements for footbrakes.

(f) *Sidewalk bicycle footbrake force test*. For sidewalk bicycles, the footbrake force transmitted to the rear wheel shall continually increase as the pedal force is applied (to 50 lbf). The ratio of applied pedal force to braking force shall not be greater than two to one.

(g) *Handlebar stem test*. (Ref. §1512.6(b)):

(1) *Procedure*. The handlebar stem shall be tested for strength by applying a force in the downward direction, for bicycles, or 1000 N (225 lbf) for sidewalk bicycles, at a point in line with the stem at an angle of 45° from the stem centerline (See fig. 2).

(2) *Criteria*. No visible fractures shall result from this test.

(h) *Handlebar test*. (Ref. §1512.6(e)):

(1) *Stem-to-fork clamp test*—(i) *Procedure*. The handlebar and handlebar stem shall be tested in accordance with the manufacturer's instructions. The handlebar-fork assembly shall be tested in the direction of the axis of the stem, and shall then be disassembled and examined for signs of structural damage, including stripping of threads, bearing damage, and bulging of the stem and fork structures. The components shall be inspected for visible signs of galling, gouging, and scoring not due to normal use.

(ii) *Criteria*. There shall be no visible movement between the stem and fork when a load of 200 ± 3, -0 N-m (15 ± 2, -0 ft = lb) for bicycles and 200 ± 3, -0 N-m (15 ± 2, -0 ft = lb) for sidewalk bicycles is applied to the stem-to-fork assembly. There shall be no visible signs of damage to the stem-to-fork assembly or any components.

(2) *Handlebar strength and clamp test*—(i) *Procedure*. The stem shall be in place and secured according to manufacturer's instructions. A load shall be applied in the downward direction to cause the greatest torque about the handlebar-to-stem clamp; deflection shall be measured.

(ii) *Criteria.* The handlebars shall support a force of no less than 445 N (100 lbf) or energy through a maximum deflection of no more than 76 mm (3.0 in.); the handlebars shall not separate from the clamp, and there shall be no visible fractures.

(i) *Pedal slip test.* [Reserved]

(j) *Rim test.* (Ref. §§1512.10 and 1512.11(c)):

(1) *Procedure.* Only one wheel need be tested if the front and rear wheel are of identical design. The wheel to be tested shall be removed from the bicycle and be supported circumferentially around the axle. A force shall be applied to the axle and normal to the plane of the wheel for at least 30 seconds. The force shall be applied in the direction of the offset.

(2) *Criteria.* The wheel and tire assembly shall be inspected for compliance with the requirements of §1512.11(b) and shall be remounted on the bicycle according to the manufacturer's instructions and shall turn freely. The wheel shall comply with the requirement of §1512.11(b).

(3) *Front hub retention test.* (Ref. §1512.12(c)).

(i) *Procedures.* Front hub locking devices shall be released. When threaded nuts are turned, they shall be open at least 360° from a finger tight condition. A separation force of at least 111 N (25 lbf) shall be applied along the slots in the fork ends.

(ii) *Criteria.* The front hub shall not separate from the fork; fenders, mudguards, stay-on wheels, or other devices shall not restrain the separation.

(k) *Fork and frame test.* (Ref. §§1512.13 and 1512.14):

(1) *Fork test*—(i) *Procedure.* With the fork stem supported in a 76 mm (3.0 in) vee block, as illustrated in figure 1 of this part 1512, a load shall be applied at the axle attachment in the centerline of the stem and against the direction of the rake. Load and deflection readings shall be taken at the point of loading.

(ii) *Criteria.* Energy of at least 39.5 J (350 in-lb) shall be absorbed with a deflection of at least 64 mm (2½ in.).

(2) *Fork and frame assembly test*—(i) *Procedure.* The fork, or one identical to that tested in §1512.18(k)(1), shall be replaced on the bicycle in accordance with the manufacturer's instructions. A force of at least 111 N (25 lbf), or an energy of at least 39.5 J (350 in-lb), whichever results in the greater force, shall be applied at the attachment point against the direction of the rake in line with the rear wheel axle. The force shall be applied at the location of the rear axle during this test.

(ii) *Criteria.* There shall be no visible evidence of fracture and no deformation of the frame at the attachment point or angle over which the front wheel can be turned.

(l) *Seat adjustment clamps and load test.* (Ref. §1512.15(c)).



(1) *Procedure.* A force of at least 668 N (150 lbf) shall be applied vertically downward to a point within 25 mm (1.0 in.) from either the front or rear of the seat, whichever procedure is specified. After removal of this force, a force of 222 N (50 lbf) shall then be applied horizontally to a point within 25 mm (1.0 in.) from either the front or rear of the seat, whichever procedure is specified.

(2) *Criteria.* No movement of the seat with respect to the seat post, or of the seat post with respect to the frame, shall have resulted from application of the forces specified.

(m) *Reflector mount and alignment test.* (Ref. §1512.16 (c) and (d)):

(1) *Procedure.* A force of 89 N (20 lbf) shall be applied to the reflector mount in at least one direction likely to affect its alignment. At least one of those directions shall be selected to represent the direction of lifting the bicycle by grasping the reflector.

(2) *Criteria.* (i) *During test:* The optical axis of the reflector shall remain parallel with the ground plane and the center plane of the bicycle defined as a plane containing both wheels and seat mast.

(ii) *Post test:* The optical axis of the reflector shall remain parallel within 5° to the ground plane and the center plane of the bicycle defined as a plane containing both wheels and the seat mast.

(n) *Reflector test.* (Ref. §1512.16(g)):

(1) *Conditioning.* The following conditioning in the order given shall be performed:

(i) *Warpage conditioning.* The reflector shall be held in a preheated oven for at least 1 hour. A pedal reflector may be conditioned integrally with its pedal.

(ii) *Mechanical impact conditioning.* The reflector shall be mounted faceup in a manner that simulates its mounting on the bicycle. A 13 mm (1/2 in.) diameter polished steel ball shall be dropped onto the reflector from a height of 0.76 m (30 in.). The ball may be guided by a tube with holes. Reflectors are exempt from this impact conditioning.

(iii) *Moisture conditioning.* The reflector shall be submerged in tap water in a suitably pressurized container at 17.2 kN/m<sup>2</sup> (2.5 psi) (equivalent to 1.7 m (5 3/4 ft.)) of water for 15 minutes.

(2) *Reflector performance test.* (i) Arrangements for the reflector performance test shall be such that the distance *D* between the light source and the reflector shall be 30.5 m (100 ft.). The source shall have a 51 mm (2.0 in.) effective diameter and a filament operating at 2,856±10 percent color temperature. The source shall be colocated (as close as practicable) with the source of illumination. The reflector shall be positioned at the center of rotation and at the same horizontal level as the source of illumination. Measurements shall be made at the observation angles and entrance angles given in tables 1 and 2.

(ii) The observation angle is the angle formed by a line from the point of observation to the center of the reflector and a second line from the center of the reflector to the source of illumination. The entrance axis of the reflector and a line from the center of the reflector to the source of illumination are designated left, right, up, and down in accordance with the position of the source of illumination relative to the reflector as viewed from behind the reflector when the plane of the observation angle is perpendicular to the plane of the source.

(iii) Photometric measurements shall be made either visually or photoelectrically. The location of the observation point shall be determined. Also, the illumination on the reflector from the source shall be determined.

(iv) For visual measurements a comparison lamp, emitting light similar in spectral characteristics to the reflector (at an angle not to exceed  $1/2^\circ$ ) and arranged so that the candlepower of the comparison lamp to make the intensity duplicate that of the reflector under test. The candlepower of the reflector under test shall be known or determined for this test. Means shall be provided to change the intensity of the comparison lamp without changing the filament color temperature. The comparison lamp shall be so arranged that the source of illumination is back in the direction of the observer. It shall be of such size that when viewed through a  $2\frac{1}{2} \times$  reducing monocular, the candlepower can be readily compared with that of the reflector. The observer shall have at least 10 minutes of dark adaption before making observations. The opening to the photocell shall not be more than  $1/2$  inch vertical by 1 inch horizontal.

(v) Reflectors that mount on the bicycle in a fixed rotational position with respect to the bicycle frame on which they are mounted (such as pedals or spokes), shall be tested with a single or multiple footcandle source. The bicycle in a fixed rotational position with respect to the bicycle shall be rotated about its axis. The minimum candlepower per footcandle for each test point. If the measurement falls below the minimum, the reflector shall be rotated  $\pm 5^\circ$  about its axis from the angle where the minimum value was obtained. The minimum per footcandle within this angle shall be the measured value.

(vi) Should uncolored reflections from the front surface interfere with photometric readings, the test point and location within  $1^\circ$  above, below, right, and left of the test point shall meet the requirements of the test point.

(vii) A recommended coordinate system for definition of color is the "International Commission on Illumination" coordinate system and when illuminated by the source defined in table 4 of this part 15, the color shall be red if its color falls within the region bounded by the red spectrum locus and the lines  $y = 0.0001$  and  $x = 0.790 - 0.667y$ , and  $y = x - 0.120$ .

(o) Reflective tire and rim test (Ref. §1512.16(h) and (i)):

(1) *Apparatus.* Arrangements for the reflective intensity measurement shall be as follows: A projector (having a maximum effective lens diameter of  $D/500$ , where  $D$  is the distance from the projector to the surface being measured) capable of projecting light of uniform intensity shall be used to illuminate the sample. The projector shall have a color temperature of  $2856^\circ\text{K} \pm 10\%$  (equivalent to a tungsten filament lamp of  $2856^\circ\text{K} \pm 10\%$  having approximately the relative energy distribution given in table 1 of ANSI Z39.1-1968). The light reflected from the test surface shall be measured with a photoelectric receiver, the response of which shall be matched to the spectral sensitivity of the average photopic human eye. The dimensions of the active area of the receiver shall be not less than  $1/2$  inch by  $1/2$  inch.



no point on the perimeter of the receiver is more than  $D/100$  from its center (where  $d$  is retroreflective surface). Wheels used for the measurement of retroreflective tires or rim surfaces, including spokes, masked in flat black so that when measured these surface. The tire shall be mounted and fully inflated. Distances shall be measured from the plane. For the tests, the distance  $D$  between the projector and the center of the wheel and distance and the receiver shall each be at least 15 m (50 ft.).

(2) *Procedure*—(i) *Masking*. The reflecting strip to be tested shall be within two centimeters more than 0.02 m (0.79 in.) greater in radius than the smaller. While additional reflector boundaries, such additional material shall not be counted in determining the average value masked off with opaque, matte black tape in testing the reflecting material.

(ii) *Orientation*. Every position of the reflecting strip on the rim or the mounted and oriented so that the normal to this portion is within 40° of parallel to the axis of rotation

(iii) *Measurement*. Measure the distance  $d$  from the receiver to the center of the wheel axis of rotation of the wheel to the unmasked portion of the reflective strip. Measure the strip at uniform intervals of no more than 45° around the wheel, with the receiver oriented radiation. The average of such readings will be the mean illumination of the sample  $E_r$ . more than 10 percent from the mean illumination, then a more uniform source must be receiver due to reflection from the retroreflective surface for each entrance angle and entrance angle this part 1512. The entrance angle and the observation angle shall be in the same plane as this part 1512) is specified when the entrance angle is small because the location of the illumination becomes important for distinguishing between ordinary mirror-like reflection incident on the test surface and the receiver shall be measured in the same units on a each combination of entrance angle and observation angle listed in table 3 as follows:

$$A = [(E_r / E_s)(d^2 / r)]$$

Where:

$A$  = Ratio in meters,

$E_r$  = Illumination incident upon the receiver,

$E_s$  = Illumination incident upon a plane perpendicular to the incident ray at the specimen position (see (o)(2)(iii) for averaging), measured in the same units as  $E_r$ ,

$d$  = The distance in meters from the receiver to the center of the wheel,

$r$  = The minimum radius in meters of the boundary circles of the retroreflective strip.

The minimum value of  $A$  shall be that listed in table 3 of this part 1512 for each combination of entrance angle. The plane containing the entrance angle and the plane containing the observation angle for a positive entrance angle corresponds to the case in which the line of sight to the receiver is in the plane of the optic axis of the reflector, and a negative entrance angle corresponds to the case in which the line of sight of the receiver and optic axis of the reflector.

(iv) *Criteria.* The ratio  $A$  as defined in §1512.18(o)(2)(iii) shall not be less than:

$$A = 4\cos^2\theta/[1 + (\Phi/0.225)^{3/2}]$$

where  $A$  is ratio in meters,  $\theta$  is the entrance angle in degrees, and  $\Phi$  is the observation angle only for entrance angles from 0° to 40° and observation angles from 0.2° to 1.5°, and  $\rho$  is the range. The values of  $A$  in table 3 are obtained from the above formula by rounding up to the next integer. In cases in which the performance of the reflector is seriously questionable, a reflector with  $A$  at or above the values in table 3 for one of the six combinations of entrance and observation angles will be considered to satisfy the requirements.

(p) *Road test.* (Ref. §§1512.15(c) and 1512.17(a)):

(1) *Procedure.* The bicycle shall be ridden at least 6.4 km (4.0 mi.) by a rider weighing at least 68 kg (150 lb.) with tires inflated to maximum recommended pressure. Travel shall include riding the bicycle over wooden cleats fastened to a paved surface. The cleats shall be a full 25 mm (1.0 in.) wide with a 12 mm by 12 mm ( 1/2 in. by 1/2 in.) chamfer of 45° on the corners contacting the pavement. The test shall be run over the 1.8 m (6.0 ft.) over the 30 m (100 ft.) course. The bicycle shall be ridden over the cleats at a speed of 15 mph with the rider firmly seated.

(2) *Criteria.* The bicycle shall exhibit stable handling, turning, and steering characteristics. There shall be no system or component failure of the structure, brakes, or tires and the rider shall be able to operate the bicycle with the seat, handlebars, controls, or reflectors.

(q) *Sidewalk bicycle proof test.* (Ref. §§1512.15(c) and 1512.17(b)):

(1) *Procedure.* The bicycle shall be loaded with weights of 13.6 kg (30 lb.) on the ends of each handle grip for a total load of 27.2 kg (60 lb.). The bicycle shall be lifted and dropped (while maintaining an upright position) three times onto a paved surface. Following the test, the bicycle shall be allowed to fall in any configuration and attitude from an upright position to the pavement.

(r) *Abrasion test for retroreflective rims.* (Ref. §1512.16(i)):

(1) This test consists of a steel wire cup brush rotating at a constant velocity of 60 m/sec (9 in./sec) to the retroreflective material on one side of a bicycle wheel rim. The rim is rotated at 1000 rpm (1000 rev/min). The test is complete when the wheel has completed 1000 revolutions.

(2) *Apparatus.* Figure 8 of this part 1512 illustrates the following test fixture arrangement for the abrasion test:

(i) *Test fixture.* The test fixture contains a clamp to hold the axle of a bicycle wheel. The axis of rotation is capable of being inclined from the vertical to bring that axis into a horizontal plane as it passes beneath the brush. The test fixture containing the retroreflective material into a horizontal plane as it passes beneath the brush. The test fixture rotate the bicycle wheel contains a means to adjust the rotational velocity to obtain the desired point on the wheel rim on the axis of the abrading brush.

(ii) *Abrader.* The abrader is a cup brush meeting the specification in paragraph (r)(1) attached to a motor that rotates about a vertical axis at the specified rotational velocity.

rotating cup brush at the specified force against the retroreflective material on the bicycle wheel. The brush is positioned on the mid point in the width of the retroreflective material. The force is applied normal to the axis of the counterbalanced motor/brush assembly.

(3) *Specifications.* (i) The linear velocity of the reflective band on wheel rim shall be 1000 ft/min at the point on the axis of the abrading brush.

(ii) The rotational velocity of the abrading brush shall be 60 rpm.

(iii) The force normal to the plane of the retroreflective material at which the abrader shall operate shall be 0.45 lbf.

(iv) The bicycle wheel shall make 1000 complete revolutions per test.

(v) The abrader shall be a cup brush having bristles that are 0.005 in. (approx. 0.13mm) outside diameter of 0.5 inch (approx. 13mm); a wire bristle length of 0.25 inch (approx. 6.35mm).<sup>6</sup>

<sup>6</sup>For compliance testing the Commission will use a brush meeting this description distributed by Dremel, Racine, Wisconsin as Dremel Part No. 442. This brush is manufactured by Weiler Brush Company.

(vi) The abrasion test shall be conducted at an ambient temperature of between 10°C and 30°C.

(4) *Procedure.* (i) The retroreflective bicycle rim to be tested shall be an unused sample. Prior to beginning the test, remove, according to instructions supplied with the bicycle, the protective covering to prevent damage in shipping.

(ii) Test the wheel in a suitable test fixture, according to the specifications in paragraph (3).

(iii) Clamp the wheel by its axle in the test fixture and align the axis of rotation so that the axis of the abrading brush is horizontal.

(iv) Shape the cup brush by hand to the specified 0.5 (approx. 13mm) diameter. A diameter of less than 1/32 in. (approx. 1 mm) beyond the tip of the bulk of the bristles should be clipped so that its axis is centered over the mid-point in the width of the retroreflective material.

(v) Adjust the rotational velocity of the bicycle wheel to obtain a linear velocity of 1000 ft/min at the mid-point in the width of the retroreflective material. Adjust the force to obtain a force normal to the plane of the reflective material of 0.45 lbf.

(vi) Apply the abrading brush to the retroreflective material on the wheel rim, and count the number of revolutions of the bicycle wheel.

[43 FR 60034, Dec. 22, 1978, as amended at 45 FR 82628, Dec. 16, 1980; 46 FR 3204, Jan. 14, 1981; 50 FR 27888, May 13, 2011]

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### **§1512.19 Instructions and labeling.**

A bicycle shall have an instruction manual attached to its frame or included with the bicycle.

(a) The instruction manual shall include at least the following:

(1) Operations and safety instructions describing operation of the brakes and gear shift, night-time operation, and a guide for safe on-and-off road operation.

(2) Assembly instructions for accomplishing complete and proper assembly.

(3) Maintenance instructions for proper maintenance of brakes, control cables, bearings, lubrication, reflectors, tires and handlebar and seat adjustments; should the manufacturer be unable to provide such instructions beyond the capability of the consumer, specifics regarding locations where such maintenance instructions may be obtained shall be included.

(b) A bicycle less than fully assembled and fully adjusted shall have clearly displayed on the outside surface of the shipping carton the following: (1) A list of tools necessary for assembly and adjustment, (2) a drawing illustrating the minimum leg-length dimension of a rider for the bicycle, and (3) the minimum leg-length dimension.

(c) The minimum leg-length dimension shall be readily understandable and shall be indicated by a line of clearance between (1) the top tube of the bicycle and the ground plane and (2) the bottom bracket. For a girl's style frame shall be specified in the same way using a corresponding boys' model.

(d) [Reserved]

(e) Every bicycle subject to the requirements of this part 1512 shall bear a marking on the frame of the bicycle in such a manner that the marking or label cannot be removed. The marking or label shall identify the name of the manufacturer or private labeler and shall indicate the month and year of manufacture or from which the manufacturer can identify the month and year of manufacture. For purposes of this paragraph, completion by the manufacturer of a bicycle of those construction or assembly operations shall constitute manufacture before the bicycle is shipped from the manufacturer's place of production to consumers.

[43 FR 60034, Dec. 22, 1978, as amended at 60 FR 62990, Dec. 8, 1995]

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### **§1512.20 Separability.**

If any section or portion thereof of this part 1512 or its application to any person or persons, or any portion thereof, shall be held invalid, the remainder of the section(s) and its (their) application to other persons or circumstances shall not be affected.

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