TABLE III—BRAKE RETARDATION FORCE

Column 1 brake retardation force/GAWR	Column 2 brake chamber pressure, PSI
0.05	20
0.12	30
0.18	40
0.25	50
0.31	60
0.37	70
0.41	80

TABLE IV [RESERVED]

TABLE V—BRAKE CHAMBER RATED VOLUMES

Brake Chamber type (nominal area of piston or diaphragm in square inches)	Column 1 full stroke (inches)	Column 2 rated volume (cubic inches)
Type 9	1.75/2.10	25
Type 12	1.75/2.10	30
Type 14	2.25/2.70	40
Type 16	2.25/2.70	46
Type 18	2.25/2.70	50
Type 20	2.25/2.70	54
Type 24	2.50/3.20	67
Type 30	2.50/3.20	89
Type 36	3.00/3.60	135

[61 FR 27290, May 31, 1996, as amended at 61 FR 49695, Sept. 23, 1996; 61 FR 60636, Nov. 29, 1996; 63 FR 7727, Feb. 17, 1998; 66 FR 64158, Dec. 12, 2001; 67 FR 36820, May 28, 2002; 68 FR 47497, Aug. 11, 2003; 74 FR 9176, Mar. 3, 2009; 74 FR 42785, Aug. 25, 2009; 75 FR 15620, Mar. 30, 2010; 76 FR 44833, July 27, 2011; 77 FR 759, Jan. 6, 2012]

§571.122 Standard No. 122; Motorcycle brake systems.

S1. *Scope.* This standard specifies performance requirements for motorcycle brake systems.

S2. *Purpose.* The purpose of the standard is to insure safe motorcycle braking performance under normal and emergency conditions.

S3. *Application.* This standard applies to motorcycles.

S4. *Definitions.*

Braking interval means the distance measured from the start of one brake application to the start of the next brake application.

Initial brake temperature means the temperature of the hottest service brake of the vehicle 0.2 mile before any brake application.

Skid number means the frictional resistance of a pavement measured in accordance with ASTM E274–70 (incorporated by reference, see §571.5) at 40 mph, omitting water delivery as specified in paragraphs 7.1 and 7.2 of that method.

Stopping distance means the distance traveled by a vehicle from the start of the brake application to the point where the vehicle stops.

Split service brake system means a brake system consisting of two or more subsystems actuated by a single control designed so that a leakage-type failure of a pressure component in a single subsystem (except structural failure of a housing that is common to all subsystems) shall not impair the operation of the other subsystem(s).

S5. *Requirements.* Each motorcycle shall meet the following requirements under the conditions specified in S6, when tested according to the procedures and in the sequence specified in S7. Corresponding test procedures of S7 are indicated in parentheses. If a motorcycle is incapable of attaining a specified speed, its service brakes shall be capable of stopping the vehicle from the multiple of 5 m.p.h. that is 4 m.p.h. to 8 m.p.h. less than the speed attainable in 1 mile, within stopping distances that do not exceed the stopping distances specified in Table 1.

S5.1 *Required equipment—split service brake system.* Each motorcycle shall have either a split service brake system or two independently actuated service brake systems.

S5.1.1 *Mechanical service brake system.* Failure of any component in a mechanical service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle.

S5.1.2 *Hydraulic service brake system.* A leakage failure in a hydraulic service brake system shall not result in a loss of braking ability in the other service brake system on the vehicle. Each motorcycle equipped with a hydraulic brake system shall have the equipment specified in S5.1.2.1 and S5.1.2.2.

S5.1.2.1 *Master cylinder reservoirs.* Each master cylinder shall have a separate reservoir for each brake circuit, with each reservoir filler opening having its own cover, seal, and cover retention device. Each reservoir shall have a minimum capacity equivalent to one and one-half times the total

fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir move from a new lining, fully retracted position to a fully worn, fully applied position. Where adjustment is a factor, the worst condition of adjustment shall be used for this measurement.

S5.1.2.2 *Reservoir labeling.* Each motorcycle shall have a brake fluid warning statement that reads as follows, in letters at least three thirty-seconds of an inch high:

Warning: Clean filler cap before removing. Use only _____ fluid from a sealed container. (Inserting the recommended type of brake fluid as specified in 49 CFR 571.116, e.g., DOT 3.)

The lettering shall be:

(a) Permanently affixed, engraved, or embossed;

(b) Located so as to be visible by direct view, either on or within 4 inches of the brake-fluid reservoir filler plug or cap; and

(c) Of a color that contrasts with its background, if it is not engraved or embossed.

S5.1.3 *Split service brake system.* In addition to the equipment required by S5.1.2 each motorcycle equipped with a split service brake system shall have a failure indicator lamp as specified in S5.1.3.1.

S5.1.3.1 *Failure indicator lamp.*

(a) One or more electrically operated service brake system failure indicator lamps that is mounted in front of and in clear view of the driver, and that is activated—

(1) In the event of pressure failure in any part of the service brake system, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, before or upon application of not more than 20 pounds of pedal force upon the service brake.

(2) Without the application of pedal force, when the level of brake fluid in a master cylinder reservoir drops to less than the recommended safe level specified by the manufacturer or to less than one-half the fluid reservoir capacity, whichever is the greater.

(b) All failure indicator lamps shall be activated when the ignition switch is turned from the ''off'' to the ''on'' or to the ''start'' position.

(c) Except for the momentary activation required by S5.1.3.1(b), each indicator lamp, once activated, shall remain activated as long as the condition exists, whenever the ignition switch is in the ''on'' position. An indicator lamp activated when the ignition is turned to the ''start'' position shall be deactivated upon return of the switch to the ''on'' position unless a failure exists in the service brake system.

(d) Each indicator lamp shall have a red lens with the legend ''Brake Failure'' on or adjacent to it in letters not less than three thirty-seconds of an inch high that shall be legible to the driver in daylight when lighted.

S5.1.4 *Parking brake.* Each three-wheeled motorcycle shall be equipped with a parking brake of a friction type with a solely mechanical means to retain engagement.

S5.1.5 *Other requirements.* The brake system shall be installed so that the lining thickness of drum brake shoes may be visually inspected, either directly or by use of a mirror without removing the drums, and so that disc brake friction lining thickness may be visually inspected without removing the pads.

S5.2 *Service brake system—first (preburnish) effectiveness.*

S5.2.1 *Service brake system.* The service brakes shall be capable of stopping the motorcycle from 30 m.p.h. and 60 m.p.h. within stopping distances which do not exceed the stopping distances specified in Column I of Table I (S7.3.1).

S5.2.2 *Partial service brake system.* Each independently actuated service brake system on each motorcycle shall be capable of stopping the motorcycle from 30 m.p.h. and 60 m.p.h. within stopping distances which do not exceed the stopping distances specified in Column II of Table I (S7.3.2).

S5.3 *Service brake system—second effectiveness.* The service brakes shall be capable of stopping the motorcycle from 30 m.p.h., 60 m.p.h., 80 m.p.h., and the multiple of 5 m.p.h. that is 4 m.p.h. to 8 m.p.h. less than the speed attainable in 1 mile if this speed is 95 m.p.h. or greater, within stopping distances

that do not exceed the stopping distances specified in Column III of Table I (S7.5).

S5.4 *Service brake system—fade and recovery.* These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 m.p.h. or less.

S5.4.1 *Baseline check—minimum and maximum pedal forces.* The pedal and lever forces used in establishing the fade baseline check average shall be within the limits specified in S6.10 (S7.6.1).

S5.4.2 *Fade.* Each motorcycle shall be capable of making 10 fade stops from 60 m.p.h. at not less than 15 f.p.s.p.s. for each stop (S7.6.2).

S5.4.3 *Fade recovery.* Each motorcycle shall be capable of making five recovery stops with a pedal force that does not exceed 400 Newtons (90 pounds), and a hand lever force that does not exceed 245 Newtons (55 pounds) for any of the first four recovery stops and that for the fifth recovery stop, is within, plus 89 Newtons (20 pounds) and minus 44 Newtons (10 pounds) of the fade test baseline check average force (S7.6.3), but not less than 0 Newtons (0 pounds).

S5.5 *Service brake system—final effectiveness.* These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less.

S5.5.1 *Service brake system.* The service brakes shall be capable of stopping the motorcycle in a manner that complies with S5.3 (S7.8.1).

S5.5.2 *Hydraulic service brake system—partial failure.* In the event of a pressure component leakage failure, other than a structural failure of either a brake master cylinder body in a split integral body type master cylinder system or a service brake system failure indicator body, the remaining portion of the service brake system shall continue to operate and shall be capable of stopping the motorcycle from 30 m.p.h. and 60 m.p.h. within stopping distances that do not exceed the stopping distances specified in Column IV of Table I (S7.8.2).

S5.6 *Parking brake system.* The parking brake system shall be capable of holding the motorcycle stationary (to the limits of traction of the braked wheels), for 5 minutes, in both forward and reverse directions, on a 30 percent grade, with an applied force of not more than 90 pounds for a foot-operated system and 55 pounds for a hand-operated system (S7.9).

S5.7 *Service brake system—water recovery.*

S5.7.1 *Baseline check.* The pedal and lever forces used in establishing the water recovery baseline check average shall be within the limits specified in S6.10 (S7.10.1).

S5.7.2 *Water recovery test.* Each motorcycle shall be capable of making five recovery stops with a pedal force that does not exceed 400 Newtons (90 pounds), and hand lever force that does not exceed 245 Newtons (55 pounds), for any of the first four recovery stops, and that for the fifth recovery stop, is within, plus 89 Newtons (20 pounds) and minus 44 Newtons (10 pounds) of the water recovery baseline check average force (S7.10.2), but not less than 0 Newtons (0 pounds).

S5.8 *Service brake system design durability.* Each motorcycle shall be capable of completing all braking requirements of S5 without detachment of brake linings from the shoes or pad, detachment or fracture of any brake system components, or leakage of fluid or lubricant at the wheel cylinder, and master cylinder reservoir cover, seal, or retention device (S7.11).

S6 *Test conditions.* The requirements of S5 shall be met under the following conditions. Where a range of conditions is specified, the motorcycle shall be capable of meeting the requirements at all points within the range.

S6.1 *Vehicle weight.* Motorcycle weight is unloaded vehicle weight plus 200 pounds (including driver and instrumentation), with the added weight distributed in the saddle or carrier if so equipped.

S6.2 *Tire inflation pressure.* Tire inflation pressure is the pressure recommended by the manufacturer for the vehicle weight specified in paragraph S6.1.

S6.3 *Transmission.* Unless otherwise specified, all stops are made with the clutch disengaged.

S6.4 *Engine.* Engine idle speed and ignition timing settings are according

to the manufacturer's recommendations. If the vehicle is equipped with an adjustable engine speed governor, it is adjusted according to the manufacturer's recommendation.

S6.5 *Ambient temperature.* The ambient temperature is between 32 °F. and 100 °F.

S6.6 *Wind velocity.* The wind velocity is zero.

S6.7 *Road surface.* Road tests are conducted on level roadway having a skid number of 81. The roadway is 8 feet wide for two-wheeled motorcycles, and overall vehicle width plus 5 feet for three-wheeled motorcycles. The parking brake test surface is clean, dry, smooth portland cement concrete.

S6.8 *Vehicle position.* The motorcycle is aligned in the center of the roadway at the start of each brake application. Stops are made without any part of the motorcycle leaving the roadway and without lockup of any wheel.

S6.9 *Thermocouples.* The brake temperature is measured by plug-type thermocouples installed in the approximate center of the facing length and width of the most heavily loaded shoe or disc pad, one per brake, as shown in Figure 1.

S6.10 *Brake actuation forces.* Except for the requirements of the fifth recovery stop in S5.4.3 and S5.7.2 (S7.6.3 and S7.10.2), the hand lever force is not less than 10 Newtons (2.3 pounds) and not more than 245 Newtons (55 pounds) and the foot pedal force is not less than 25 Newtons (5.6 pounds) and not more than 400 Newtons (90 pounds). The point of initial application of the lever forces is 1.2 inches from the end of the brake lever grip. The direction of the force is perpendicular to the handle grip on the plane along which the brake lever rotates, and the point of application of the pedal force is the center of the foot contact pad of the brake pedal. The direction of the force is perpendicular to the foot contact pad on the plane along which the brake pedal rotates, as shown in Figure 2.

S7. *Test procedures and sequence.* Each motorcycle shall be capable of meeting all the requirements of this standard when tested according to the procedures and in the sequence set forth below without replacing any brake system part, or making any adjustments to the brake system other than as permitted in S7.4. A motorcycle shall be deemed to comply with S5.2, S5.3 and S5.5 if at least one of the stops specified in S7.3, S7.5 and S7.8 is made within the stopping distances specified in Table I.

S7.1 *Braking warming.* If the initial brake temperature for the first stop in a test procedure (other than S7.10) has not been reached, heat the brakes to the initial brake temperature by making up to 10 stops from 30 m.p.h. at a deceleration of not more than 10 f.p.s.p.s. On independently operated brake systems, the coldest brake shall be within 10 °F. of the hottest brake.

S7.2 *Pretest instrumentation check.* Conduct a general check of test instrumentation by making not more than 10 stops from a speed of not more than 30 m.p.h. at a deceleration of not more than 10 f.p.s.p.s. If test instrument repair, replacement, or adjustment is necessary, make not more than 10 additional stops after such repair, replacement or adjustment.

S7.3 *Service brake system—first (preburnished) effectiveness test.*

S7.3.1 *Service brake system.* Make six stops from 30 m.p.h. and then six stops from 60 m.p.h. with an initial brake temperature between 130 °F. and 150 °F.

S7.3.2 *Partial service brake system.* For a motorcycle with two independently actuated service brake systems, repeat S7.3.1 using each service brake system individually.

S7.4 *Service brake system—burnish procedure.* Burnish the brakes by making 200 stops from 30 m.p.h. at 12 f.p.s.p.s. The braking interval shall be either the distance necessary to reduce the initial brake temperature to between 130 °F. and 150 °F. or 1 mile, whichever occurs first. Accelerate at maximum rate to 30 m.p.h. immediately after each stop and maintain that speed until making the next stop. After burnishing adjust the brakes in accordance with the manufacturer's recommendation.

S7.5 *Service brake system—second effectiveness test.* Repeat S7.3.1. Then, make four stops from 80 m.p.h. and four stops from the multiple of 5 m.p.h. that is 4 m.p.h. to 8 m.p.h. less than the speed attainable in 1 mile if that speed is 95 m.p.h. or greater.

S7.6 *Service brake system—fade and recovery test.* These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 m.p.h. or less.

S7.6.1 *Baseline check stops.* Make three stops from 30 m.p.h. at 10 to 11 f.p.s.p.s. for each stop. Compute the average of the maximum brake pedal forces and the maximum brake lever forces required for the three stops.

S7.6.2 *Fade stops.* Make 10 stops from 60 m.p.h. at not less than 15 f.p.s.p.s. for each stop. The initial brake temperature before the first brake application shall be between 130 °F. and 150 °F. Initial brake temperatures before brake applications for subsequent stops shall be those occurring at the distance intervals. Attain the required deceleration as quickly as possible and maintain at least this rate for not less than three-fourths of the total stopping distance for each stop. The interval between the starts of service brake applications shall be 0.4 mile. Drive 1 mile at 30 m.p.h. after the last fade stop and immediately conduct the recovery test specified in S7.6.3.

S7.6.3 *Recovery test.* Make five stops from 30 m.p.h. at 10 to 11 f.p.s.p.s. for each stop. The braking interval shall not be more than 1 mile. Immediately after each stop accelerate at maximum rate to 30 m.p.h. and maintain that speed until making the next stop.

S7.7 *Service brake system—reburnish.* Repeat S7.4 except make 35 burnish stops instead of 200 stops. Brakes may be adjusted after reburnish if no tools are used. These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 m.p.h. or less.

S7.8 *Service brake system—final effectiveness test.* These requirements do not apply to a motor-driven cycle whose speed attainable in 1 mile is 30 m.p.h. or less.

S7.8.1 *Service brake system.* Repeat S7.5 including S7.3.1.

S7.8.2 *Partial service brake system test.* Alter the service brake system on three-wheeled motorcycles to induce a complete loss of braking in any one subsystem. Determine the line pressure or pedal force necessary to cause the brake system failure indicator to operate. Make six stops from 30 m.p.h. and then six stops from 60 m.p.h. with an initial brake temperature between 130 °F. and 150 °F. Repeat for each subsystem. Determine that the brake failure indicator is operating when the master cylinder fluid level is less than the level specified in S5.1.3.1(a)(2), and that it complies with S5.1.3.1(c). Check for proper operation with each reservoir in turn at a low level. Restore the service brake system to normal at completion of this test.

S7.9 *Parking brake test.* Starting with an initial brake temperature of not more than 150 °F., drive the motorcycle downhill on the 30 percent grade with the longitudinal axis of the motorcycle in the direction of the grade. Apply the service brakes with a force not exceeding 90 pounds to stop the motorcycle and place the transmission in neutral. Apply the parking brake by exerting a force not exceeding those specified in S5.6. Release the service brake and allow the motorcycle to remain at rest (to the limit of traction of the braked wheels) for 5 minutes. Repeat the test with the motorcycle parked in the reversed (uphill) position on the grade.

S7.10 *Service brake system—water recovery test.*

S7.10.1 *Baseline check stops.* Make three stops from 30 m.p.h. at 10 to 11 f.p.s.p.s. for each stop. Compute the average of the maximum brake pedal forces and of the maximum brake lever forces required for the three stops.

S7.10.2 *Wet brake recovery stops.* Completely immerse the rear brake assembly of the motorcycle in water for 2 minutes with the brake fully released. Next completely immerse the front brake assembly of the motorcycle in water for 2 minutes with the brake fully released. Perform the entire wetting procedure in not more than 7 minutes. Immediately after removal of the front brake from water, accelerate at a maximum rate to 30 mi/h without a brake application. Immediately upon reaching that speed make five stops, each from 30 mi/h at 10 to 11 ft/s^2 for each stop. After each stop (except the last) accelerate the motorcycle immediately at a maximum rate to 30 mi/h and begin the next stop.

S7.11 *Final inspection.* Upon completion of all the tests inspect the brake

system in an assembled condition, for compliance with the brake lining inspection requirements. Disassemble all brakes and inspect:

(a) The entire brake system for detachment or fracture of any component.

(b) Brake linings for detachment from the shoe or pad.

(c) Wheel cylinder, master cylinder, and axle seals for fluid or lubricant leakage.

(d) Master cylinder for reservoir capacity and retention device.

(e) Master cylinder label for compliance with S5.1.2.2.

TABLE I—STOPPING DISTANCES FOR EFFECTIVENESS, FADE AND PARTIAL SYSTEM TESTS

Vehicle test speed, m.p.h.	Stopping distance, feet—Effectiveness tests			
	Preburnish effectiveness total system (S5.2.1)—I	Preburnish effectiveness partial mechanical systems (S5.2.2)—II	Effectiveness total system (S5.4) (SS5.7.1)—III	Effectiveness partial hydraulic systems (S5.7.2)—IV
15	13	30	11	25
20	24	54	19	44
25	37	84	30	68
30	54	121	43	97
35	74	165	58	132
40	96	216	75	173
45	121	273	95	218
50	150	337	128	264
55	181	407	155	326
60	216	484	185	388
65	.....	.....	217	455
70	.....	.....	264	527
75	.....	.....	303	606
80	.....	.....	345	689
85	.....	.....	389	778
90	.....	.....	484	872
95	.....	.....	540	971
100	.....	.....	598	1076
105	.....	.....	659	1188
110	.....	.....	723	1302
115	.....	.....	791	1423
120	.....	.....	861	1549

TABLE II—BRAKE TEST SEQUENCE AND REQUIREMENTS

Sequence L.C.	Test procedure	Requirements
1. Instrumentation check	S7.2	.....
2. First (Preburnish) effectiveness test:		
(a) Service brake system	S7.3.1	S5.2.1
(b) Partial service brake system	S7.3.2	S5.2.2
3. Burnish procedure	S7.4	.....
4. Second effectiveness test	S7.5	S5.3
5. First fade and recovery test	S7.6	S5.4
6. Reburnish	S7.7	.....
7. Final effectiveness test:		
(a) Service brake system	S7.8.1	S5.5.1
(b) Partial service brake system	S7.8.2	S5.5.2
8. Parking brake test (three-wheeled motorcycles only)	S7.9	S5.6
9. Water recovery test	S7.10	S5.7
10. Design durability	S7.11	S5.8

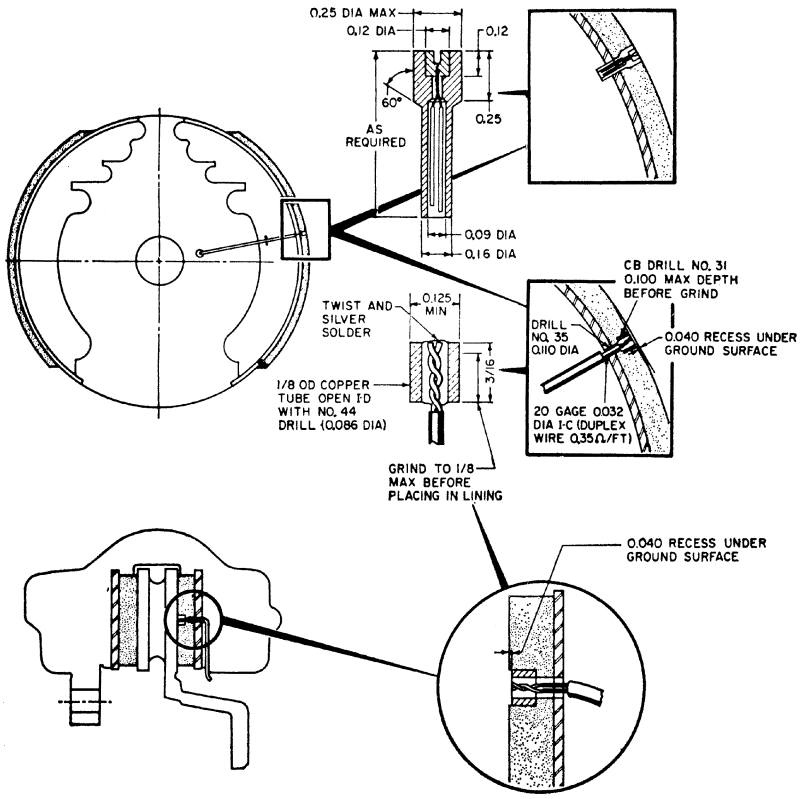
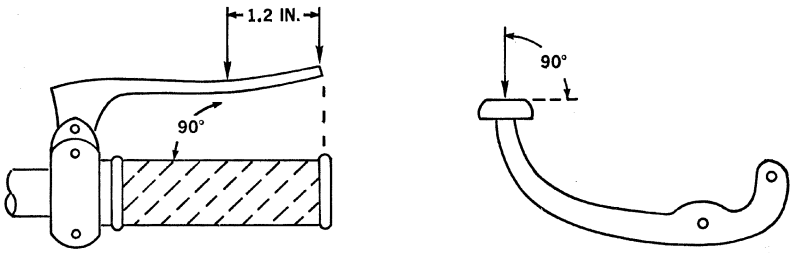


FIGURE 1 - TYPICAL PLUG TYPE THERMOCOUPLE INSTALLATIONS

FIG. 2 DIRECTION OF FORCE



(Authority: Delegation of authority at 38 FR 12147; secs. 102, 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1391, 1392, 1407); delegations of authority at 49 CFR 1.50 and 49 CFR 501.8)

[37 FR 5034, Mar. 9, 1972, as amended at 37 FR 11974, June 16, 1972; 38 FR 14753, June 5, 1973; 39 FR 32914, Sept. 12, 1974; 39 FR 43075, Dec. 10, 1974; 41 FR 24593, June 17, 1976; 43 FR 9606, Mar. 9, 1978; 43 FR 46548, Oct. 10, 1978; 66 FR 42617, Aug. 14, 2001; 77 FR 760, Jan. 6, 2012]

EFFECTIVE DATE NOTE: At 77 FR 51671, Aug. 24, 2012, § 571.122 was redesignated as § 571.122a, a new § 571.122 was added, and in the new § 571.122a, S3 was revised, effective Oct. 23, 2012. For the convenience of the user, the added and revised text is set forth as follows:

§ 571.122 Standard No. 122; Motorcycle brake systems.

S1. *Scope.* This standard specifies requirements for motorcycle service brake systems and, where applicable, associated parking brake systems.

S2. *Purpose.* The purpose of the standard is to ensure safe motorcycle braking performance under normal and emergency riding conditions.

S3. *Application.* This standard applies to category 3–1 motorcycles, category 3–2 motorcycles, category 3–3 motorcycles, and category 3–4 motorcycles manufactured on and after September 1, 2014. This standard applies to category 3–5 motorcycles manufactured on and after September 1, 2015. At the manufacturer's option, any motorcycle manufactured on or after October 23, 2012 may comply with this standard.

S4. *Definitions.*

Antilock brake system or *ABS* means a system which senses wheel slip and automatically modulates the pressure producing the braking forces at the wheel(s) to limit the degree of wheel slip.

Baseline test means a stop or a series of stops carried out in order to confirm the performance of the brake prior to subjecting it to a further test such as the heating procedure or wet brake stop.

Brake means those parts of the brake system where the forces opposing the movement of the motorcycle are developed.

Brake system means the combination of parts consisting of the control, the brake, and the components that provide the functional link between the control and the brake, but excluding the engine, whose function it is to progressively reduce the speed of a moving motorcycle, bring it to a halt, and keep it stationary when halted.

Category 3–1 motorcycle means a two-wheeled motorcycle with an engine cylinder capacity in the case of a thermic engine not exceeding 50 cubic centimeters (cm^3) and whatever the means of propulsion a maximum design speed not exceeding 50 kilometers per hour (km/h).

Category 3–2 motorcycle means a three-wheeled motorcycle of any wheel arrangement with an engine cylinder capacity in the case of a thermic engine not exceeding 50 cm^3 and whatever the means of propulsion a maximum design speed not exceeding 50 km/h.

Category 3–3 motorcycle means a two-wheeled motorcycle with an engine cylinder capacity in the case of a thermic engine exceeding 50 cm^3 or whatever the means of propulsion a maximum design speed exceeding 50 km/h.

Category 3–4 motorcycle means a motorcycle manufactured with three wheels asymmetrically arranged in relation to the longitudinal median plane with an engine cylinder capacity in the case of a thermic engine exceeding 50 cm^3 or whatever the means of propulsion a maximum design speed exceeding 50 km/h. (This category definition is intended to include motorcycles with sidecars.)

Category 3–5 motorcycle means a motorcycle manufactured with three wheels symmetrically arranged in relation to the longitudinal median plane with an engine cylinder capacity in the case of a thermic engine exceeding 50 cm^3 or whatever the means of propulsion a maximum design speed exceeding 50 km/h.

Combined brake system or *CBS* means:

(a) For motorcycle categories 3–1 and 3–3: a service brake system where at least two brakes on different wheels are actuated by the operation of a single control.

(b) For motorcycle categories 3–2 and 3–5: a service brake system where the brakes on all wheels are actuated by the operation of a single control.

(c) For motorcycle category 3–4: a service brake system where the brakes on at least the front and rear wheels are actuated by the operation of a single control. (If the rear wheel and the asymmetrical wheel are braked by the same brake system, this is regarded as the rear brake.)

Control means the part actuated directly by the rider in order to supply and regulate the energy required for braking the motorcycle.

Driver mass means the nominal mass of a driver that equals 75 kg (68 kg occupant mass plus 7kg of luggage mass).

Engine disconnected means when the engine is no longer internally connected to the driving wheel(s), i.e., the clutch is disengaged and/or the transmission is in neutral.

Gross vehicle mass means the maximum mass of the fully laden solo vehicle, based on its construction and design performances, as declared by the manufacturer.

Initial brake temperature means the temperature of the hottest brake before any brake application.

Laden means the gross vehicle mass.

Lightly loaded means mass in running order plus 15 kg for test equipment, or the laden condition, whichever is less. In the case of ABS tests on a low friction surface (paragraphs S6.9.4 to S6.9.7), the mass for test equipment is increased to 30 kg to account for outriggers.

Mass in running order means the sum of unladen vehicle mass and driver mass.

Peak braking coefficient or *PBC* means the measure of tire-to-road surface friction

based on the maximum deceleration of a rolling tire.

Power-assisted braking system means a brake system in which the energy necessary to produce the braking force is supplied by the physical effort of the rider assisted by one or more energy supplying devices, for example vacuum assisted (with vacuum booster).

Secondary brake system means the second service brake system on a motorcycle equipped with a combined brake system.

Service brake system means a brake system which is used for slowing the motorcycle when in motion.

Sidecar means a one-wheeled vehicle that is attached to the side of a motorcycle.

Single brake system means a brake system which acts on only one axle.

Split service brake system or *SSBS* means a brake system that operates the brakes on all wheels, consisting of two or more subsystems actuated by a single control designed so that a single failure in any subsystem (such as a leakage type failure of a hydraulic subsystem) does not impair the operation of any other subsystem.

Stopping distance means the distance traveled by the motorcycle from the point the rider begins to actuate the brake control to the point at which the motorcycle reaches full stop. For tests where simultaneous actuation of two controls is specified, the distance traveled is taken from the point the first control is actuated.

Test speed means the motorcycle speed measured the moment the rider begins to actuate the brake control. For tests where simultaneous actuation of two controls is specified, the motorcycle speed is taken from the moment the first control is actuated.

Unladen vehicle mass means the nominal mass of a complete vehicle as determined by the following criteria:

(a) Mass of the vehicle with bodywork and all factory fitted equipment, electrical and auxiliary equipment for normal operation of vehicle, including liquids, tools, fire extinguisher, standard spare parts, chocks and spare wheel, if fitted.

(b) The fuel tanks filled to at least 90 percent of rated capacity and the other liquid containing systems (except those for used water) to 100 percent of the capacity specified by the manufacturer.

Vmax means either the speed attainable by accelerating at a maximum rate from a standing start for a distance of 1.6 km on a level surface, with the vehicle lightly loaded, or the speed measured in accordance with International Organization for Standardization (ISO) 7117:1995(E) (incorporated by reference; see § 571.5).

Wheel lock means the condition that occurs when there is 100 percent wheel slip.

S5. *General requirements.*

S5.1 *Brake system requirements.* Each motorcycle shall meet each of the test requirements specified for a motorcycle of its category and for those brake features on the motorcycle.

S5.1.1 *Service brake system control operation.* Each motorcycle shall have a configuration that enables a rider to actuate the service brake system control while seated in the normal driving position and with both hands on the steering control.

S5.1.2 *Secondary brake system control operation.* Each motorcycle shall have a configuration that enables a rider to actuate the secondary brake system control while seated in the normal driving position and with at least one hand on the steering control.

S5.1.3 *Parking brake system.*

(a) If a parking brake system is fitted, it shall hold the motorcycle stationary on the slope prescribed in S6.8.2. The parking brake system shall:

(1) have a control which is separate from the service brake system controls; and

(2) be held in the locked position by solely mechanical means.

(b) Each motorcycle equipped with a parking brake shall have a configuration that enables a rider to be able to actuate the parking brake system while seated in the normal driving position.

S5.1.4 *Two-wheeled motorcycles of categories 3–1 and 3–3.* Each category 3–1 and 3–3 two-wheeled motorcycle shall be equipped with either two separate service brake systems, or a split service brake system, with at least one brake operating on the front wheel and at least one brake operating on the rear wheel.

S5.1.5 *Three-wheeled motorcycles of category 3–4.* Each category 3–4 motorcycle shall comply with the brake system requirements in S5.1.4. A brake on the asymmetric wheel (with respect to the longitudinal axis) is not required.

S5.1.6 *Three-wheeled motorcycles of category 3–2.* Each category 3–2 motorcycle shall be equipped with a parking brake system plus one of the following service brake systems:

(a) Two separate service brake systems, except CBS, which, when applied together, operate the brakes on all wheels; or

(b) A split service brake system; or

(c) A CBS that operates the brake on all wheels and a secondary brake system which may be the parking brake system.

S5.1.7 *Three-wheeled motorcycles of categories 3–5.* Each category 3–5 motorcycle shall be equipped with:

(a) A parking brake system; and

(b) A foot actuated service brake system which operates the brakes on all wheels by way of either:

(1) A split service brake system; or

(2) A CBS and a secondary brake system, which may be the parking brake system.

S5.1.8 *Two separate service brake systems.* For motorcycles where two separate service brake systems are installed, the systems

may share a common brake, if a failure in one system does not affect the performance of the other.

S5.1.9 *Hydraulic service brake system.* For motorcycles that use hydraulic fluid for brake force transmission, the master cylinder shall:

(a) Have a sealed, covered, separate reservoir for each brake system; and

(b) Have a minimum reservoir capacity equivalent to 1.5 times the total fluid displacement required to satisfy the new to fully worn lining condition with the worst case brake adjustment conditions; and

(c) Have a reservoir where the fluid level is visible for checking without removal of the cover.

(d) Have a brake fluid warning statement that reads as follows, in letters at least 3/32 of an inch high: *Warning: Clean filler cap before removing. Use only _____ fluid from a sealed container* (inserting the recommended type of brake fluid as specified in accordance with 49 CFR 571.116, e.g., ''DOT 3''). The lettering shall be:

(1) Permanently affixed, engraved, or embossed;

(2) Located so as to be visible by direct view, either on or within 4 inches of the brake-fluid reservoir filler plug or cap; and

(3) Of a color that contrasts with its background, if it is not engraved or embossed.

S5.1.10 *Warning lamps.* All warning lamps shall be mounted in the rider's view.

S5.1.10.1 *Split service brake system warning lamps.*

(a) Each motorcycle that is equipped with a split service brake system shall be fitted with a red warning lamp, which shall be activated:

(1) When there is a hydraulic failure on the application of a force of ≤ 90 N on the control; or

(2) Without actuation of the brake control, when the brake fluid level in the master cylinder reservoir falls below the greater of:

(i) That which is specified by the manufacturer; or

(ii) That which is less than or equal to half of the fluid reservoir capacity.

(b) To permit function checking, the warning lamp shall be illuminated by the activation of the ignition switch and shall be extinguished when the check has been completed. The warning lamp shall remain on while a failure condition exists whenever the ignition switch is in the ''on'' position.

(c) Each indicator lamp shall have the legend ''Brake Failure'' on or adjacent to it in letters not less than 3/32 of an inch high that shall be legible to the driver in daylight when lighted.

S5.1.10.2 *Antilock brake system warning lamps.*

(a) Each motorcycle equipped with an ABS system shall be fitted with a yellow warning lamp. The lamp shall be activated whenever there is a malfunction that affects the generation or transmission of signals in the motorcycle's ABS system.

(b) To permit function checking, the warning lamp shall be illuminated by the activation of the ignition switch and extinguished when the check has been completed. The warning lamp shall remain on while a failure condition exists whenever the ignition switch is in the ''on'' position.

(c) The indicator shall be labeled in letters at least 3/32 of an inch high with the words ''Antilock'' or ''Anti-lock'' or ''ABS'' in accordance with Table 1 of Standard No. 101 (49 CFR 571.101).

S5.2 *Durability.*

S5.2.1 *Compensation for wear.* Wear of the brakes shall be compensated for by means of a system of automatic or manual adjustment.

S5.2.2 *Notice of wear.* The friction material thickness shall either be visible without disassembly, or where the friction material is not visible, wear shall be assessed by means of a device designed for that purpose.

S5.2.3 *Testing.* During all the tests in this standard and on their completion, there shall be no friction material detachment and no leakage of brake fluid.

S5.3 *Measurement of dynamic performance.* There are two ways in which brake system performance is measured. The particular method to be used is specified in the respective tests in S6.

S5.3.1 *Stopping distance.*

(a) Based on the basic equations of motion:

$S = 0.1 \cdot V + (X) \cdot V^2$,

Where:

S = stopping distance in meters
V = initial vehicle speed in km/h
X = a variable based on the requirement for each test

(b) To calculate the corrected stopping distance using the actual vehicle test speed, the following formula is used:

$Ss = 0.1 \cdot Vs + (Sa - 0.1 \cdot Va) \cdot Vs^2/Va^2$,

Where:

Ss = corrected stopping distance in meters
Vs = specified vehicle test speed in km/h
Sa = actual stopping distance in meters
Va = actual vehicle test speed in km/h

NOTE TO S5.3.1(B): This equation is only valid when the actual test speed (Va) is within ± 5 km/h of the specified test speed (Vs).

S5.3.2 *Continuous deceleration recording.* The other method used to measure performance is the continuous recording of the vehicle instantaneous deceleration from the moment a force is applied to the brake control until the end of the stop.

S6. *Test conditions, procedures and performance requirements.*

S6.1 *General.*

S6.1.1 *Test surfaces.*

S6.1.1.1 *High friction surface.* A high friction surface is used for all dynamic brake tests excluding the ABS tests where a low-friction surface is specified. The high-friction surface test area is a clean, dry and level surface, with a gradient of ≤ 1 percent. The high-friction surface has a peak braking coefficient (PBC) of 0.9.

S6.1.1.2 *Low-friction surface.* A low-friction surface is used for ABS tests where a low-friction surface is specified. The low-friction surface test area is a clean and level surface, which may be wet or dry, with a gradient of ≤ 1 percent. The low-friction surface has a PBC of ≤ 0.45.

S6.1.1.3 *Measurement of PBC.* The PBC is measured using the American Society for Testing and Materials (ASTM) E1136–93 (Reapproved 2003) standard reference test tire, in accordance with ASTM Method E1337–90 (Reapproved 2008), at a speed of 64 km/h (both publications incorporated by reference; see § 571.5).

S6.1.1.4 *Parking brake system tests.* The specified test slope has a clean and dry surface that does not deform under the weight of the motorcycle.

S6.1.1.5 *Test lane width.* For two-wheeled motorcycles (motorcycle categories 3–1 and 3–3) the test lane width is 2.5 meters. For three-wheeled motorcycles (motorcycle categories 3–2, 3–4 and 3–5) the test lane width is 2.5 meters plus the vehicle width.

S6.1.2 *Ambient temperature.* The ambient temperature is between 4 °C and 45 °C.

S6.1.3 *Wind speed.* The wind speed is not more than 5 meters per second (m/s).

S6.1.4 *Test speed tolerance.* The test speed tolerance is ± 5 km/h. In the event of the actual test speed deviating from the specified test speed (but within the ± 5 km/h tolerance), the actual stopping distance is corrected using the formula in S5.3.1(b).

S6.1.5 *Automatic transmission.* Motorcycles with automatic transmission shall meet all test requirements—whether they are for ''engine connected'' or ''engine disconnected.'' If an automatic transmission has a neutral position, the neutral position is selected for tests where ''engine disconnected'' is specified.

S6.1.6 *Vehicle position and wheel lock.* The vehicle is positioned in the center of the test lane for the beginning of each stop. Stops are made without the vehicle wheels passing outside the applicable test lane and without wheel lock.

S6.1.7 *Test sequence.* Test sequence is as specified in Table 1.

S6.2 *Preparation.*

S6.2.1 *Engine idle speed.* The engine idle speed is set to the manufacturer's specification.

S6.2.2 *Tire pressures.* The tires are inflated to the manufacturer's specification for the vehicle loading condition for the test.

S6.2.3 *Control application points and direction.* For a hand control lever, the input force (F) is applied on the control lever's forward surface perpendicular to the axis of the lever fulcrum and its outermost point on the plane along which the control lever rotates (see Figure 1). The input force is applied to a point located 50 millimeters (mm) from the outermost point of the control lever, measured along the axis between the central axis of the fulcrum of the lever and its outermost point. For a foot control pedal, the input force is applied to the center of, and at right angles to, the control pedal.

S6.2.4 *Brake temperature measurement.* The brake temperature is measured on the approximate center of the facing length and width of the most heavily loaded shoe or disc pad, one per brake, using a plug-type thermocouple that is embedded in the friction material, as shown in Figure 2.

S6.2.5 *Burnishing procedure.* The vehicle brakes are burnished prior to evaluating performance.

S6.2.5.1 *Vehicle condition.*

(a) Vehicle lightly loaded.

(b) Engine disconnected.

S6.2.5.2 *Conditions and procedure.*

(a) *Initial brake temperature.* Initial brake temperature before each brake application is ≤ 100 °C.

(b) *Test speed.*

(1) Initial speed: 50 km/h or 0.8 Vmax, whichever is lower.

(2) Final speed = 5 to 10 km/h.

(c) *Brake application.* Each service brake system control actuated separately.

(d) *Vehicle deceleration.*

(1) Single front brake system only:

(i) 3.0–3.5 meters per second squared (m/s^2) for motorcycle categories 3–3 and 3–4

(ii) 1.5–2.0 m/s^2 for motorcycle categories 3–1 and 3–2

(2) Single rear brake system only: 1.5–2.0 m/s^2

(3) CBS or split service brake system, and category 3–5: 3.5–4.0 m/s^2

(e) *Number of decelerations.* There shall be 100 decelerations per brake system.

(f) For the first stop, accelerate the vehicle to the initial speed and then actuate the brake control under the conditions specified until the final speed is reached. Then reaccelerate to the initial speed and maintain that speed until the brake temperature falls to the specified initial value. When these conditions are met, reapply the brake as specified. Repeat this procedure for the number of specified decelerations. After burnishing, adjust the brakes in accordance with the manufacturer's recommendations.

S6.3 *Dry stop test—single brake control actuated.*

S6.3.1 *Vehicle condition.*

(a) The test is applicable to all motorcycle categories.

(b) Laden. For vehicles fitted with CBS and split service brake system, the vehicle is tested in the lightly loaded condition in addition to the laden condition.

(c) Engine disconnected.

S6.3.2 *Test conditions and procedure.*

(a) *Initial brake temperature.* Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(b) *Test speed.*

(1) Motorcycle categories 3–1 and 3–2: 40 km/h or 0.9 Vmax, whichever is lower.

(2) Motorcycle categories 3–3, 3–4 and 3–5: 60 km/h or 0.9 Vmax, whichever is lower.

(c) *Brake application.* Each service brake system control actuated separately.

(d) *Brake actuation force.*

(1) Hand control: ≤ 200 N.

(2) Foot control:

(i) ≤ 350 N for motorcycle categories 3–1, 3–2, 3–3 and 3–5.

(ii) ≤ 500 N for motorcycle category 3–4.

(e) Number of stops: until the vehicle meets the performance requirements, with a maximum of 6 stops.

(f) For each stop, accelerate the vehicle to the test speed and then actuate the brake control under the conditions specified in this paragraph.

S6.3.3 *Performance requirements.* When the brakes are tested in accordance with the test procedure set out in paragraph S6.3.2., the stopping distance shall be as specified in column 2 of Table 2.

S6.4 *Dry stop test—all service brake controls actuated.*

S6.4.1 *Vehicle condition.*

(a) The test is applicable to motorcycle categories 3–3, 3–4 and 3–5.

(b) Lightly loaded.

(c) Engine disconnected.

S6.4.2 *Test conditions and procedure.*

(a) *Initial brake temperature.* Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(b) *Test speed.* Test speed is 100 km/h or 0.9 Vmax, whichever is lower.

(c) *Brake application.* Simultaneous actuation of both service brake system controls, if so equipped, or of the single service brake system control in the case of a service brake system that operates on all wheels.

(d) *Brake actuation force.*

(1) Hand control: ≤ 250 N.

(2) Foot control:

(i) ≤ 400 N for motorcycle categories 3–3 and 3–4.

(ii) ≤ 500 N for motorcycle category 3–5.

(e) Number of stops: until the vehicle meets the performance requirements, with a maximum of 6 stops.

(f) For each stop, accelerate the vehicle to the test speed and then actuate the brake control under the conditions specified in this paragraph.

S6.4.3 *Performance requirements.* When the brakes are tested in accordance with the test procedure set out in paragraph S6.4.2., the stopping distance (S) shall be $S \leq 0.0060\ V^2$ (where V is the specified test speed in km/h and S is the required stopping distance in meters).

S6.5 *High speed test.*

S6.5.1 *Vehicle condition.*

(a) The test is applicable to motorcycle categories 3–3, 3–4 and 3–5.

(b) Test is not required for vehicles with Vmax ≤ 125 km/h.

(c) Lightly loaded.

(d) Engine connected (clutch engaged) with the transmission in the highest gear.

S6.5.2 *Test conditions and procedure.*

(a) *Initial brake temperature.* Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(b) *Test speed.*

(1) Test speed is 0.8 Vmax for motorcycles with Vmax > 125 km/h and < 200 km/h.

(2) Test speed is 160 km/h for motorcycles with Vmax ≥ 200 km/h.

(c) *Brake application.* Simultaneous actuation of both service brake system controls, if so equipped, or of the single service brake system control in the case of a service brake system that operates on all wheels.

(d) *Brake actuation force.*

(1) Hand control: ≤ 200 N.

(2) Foot control:

(i) ≤ 350 N for motorcycle categories 3–3 and 3–4.

(ii) ≤ 500 N for motorcycle category 3–5.

(e) Number of stops: until the vehicle meets the performance requirements, with a maximum of 6 stops.

(f) For each stop, accelerate the vehicle to the test speed and then actuate the brake control(s) under the conditions specified in this paragraph.

S6.5.3 *Performance requirements.* When the brakes are tested in accordance with the test procedure set out in paragraph S6.5.2, the stopping distance (S) shall be $\leq 0.1\ V + 0.0067\ V^2$ (where V is the specified test speed in km/h and S is the required stopping distance in meters).

S6.6 *Wet brake test.*

S6.6.1 *General information.*

(a) The test is comprised of two parts that are carried out consecutively for each brake system:

(1) A baseline test based on the dry stop test—single brake control actuated (S6.3).

(2) A single wet brake stop using the same test parameters as in (1), but with the brake(s) being continuously sprayed with water while the test is conducted in order to measure the brakes' performance in wet conditions.

(b) The test is not applicable to parking brake systems unless it is the secondary brake.

(c) Drum brakes or fully enclosed disc brakes are excluded from this test unless ventilation or open inspection ports are present.

(d) This test requires the vehicle to be fitted with instrumentation that gives a continuous recording of brake control force and vehicle deceleration.

S6.6.2 *Vehicle condition.*

(a) The test is applicable to all motorcycle categories.

(b) Laden. For vehicles fitted with CBS and split service brake system, the vehicle is tested in the lightly loaded condition in addition to the laden condition.

(c) Engine disconnected.

(d) Each brake is fitted with water spray equipment as shown in Figure 3.

(1) *Disc brakes—sketch of water spray equipment.* The disc brake water spray equipment is installed as follows:

(i) Water is sprayed onto each brake with a flow rate of 15 liters/hr. The water is equally distributed on each side of the rotor.

(ii) If the surface of the rotor has any shielding, the spray is applied 45° prior to the shield.

(iii) If it is not possible to locate the spray in the position shown on the sketch, or if the spray coincides with a brake ventilation hole or similar, the spray nozzle may be advanced by an additional 90° maximum from the edge of the pad, using the same radius.

(2) *Drum brakes with ventilation and open inspection ports.* The water spray equipment is installed as follows:

(i) Water is sprayed equally onto both sides of the drum brake assembly (on the stationary back plate and on the rotating drum) with a flow rate of 15 liters/hr.

(ii) The spray nozzles are positioned two thirds of the distance from the outer circumference of the rotating drum to the wheel hub center.

(iii) The nozzle position is > 15° from the edge of any opening in the drum back plate.

S6.6.3 *Baseline test—test conditions and procedure.*

(a) The test in paragraph S6.3 (dry stop test—single brake control actuated) is carried out for each brake system but with the brake control force that results in a vehicle deceleration of 2.5–3.0 m/s^2, and the following is determined:

(1) The average brake control force measured when the vehicle is traveling between 80 percent and 10 percent of the specified test speed.

(2) The average vehicle deceleration in the period 0.5 to 1.0 seconds after the point of actuation of the brake control.

(3) The maximum vehicle deceleration during the complete stop but excluding the final 0.5 seconds.

(b) Conduct 3 baseline stops and average the values obtained in (1), (2), and (3).

S6.6.4 *Wet brake test—test conditions and procedure.*

(a) The vehicle is ridden at the test speed used in the baseline test set out in S6.6.3 with the water spray equipment operating on the brake(s) to be tested and with no application of the brake system.

(b) After a distance of ≥ 500 m, apply the average brake control force determined in the baseline test for the brake system being tested.

(c) Measure the average vehicle deceleration in the period 0.5 to 1.0 seconds after the point of actuation of the brake control.

(d) Measure the maximum vehicle deceleration during the complete stop but excluding the final 0.5 seconds.

S6.6.5 *Performance requirements.* When the brakes are tested in accordance with the test procedure set out in paragraph S6.6.4, the wet brake deceleration performance shall be:

(a) The value measured in paragraph S6.6.4(c) shall be ≥ 60 percent of the average deceleration values recorded in the baseline test in paragraph S6.6.3(a)(2), i.e., in the period 0.5 to 1.0 seconds after the point of actuation of the brake control; and

(b) The value measured in S6.6.4(d) shall be ≤ 120 percent of the average deceleration values recorded in the baseline test S6.6.3(a)(3), i.e., during the complete stop but excluding the final 0.5 seconds.

S6.7 *Heat fade test.*

S6.7.1 *General information.*

(a) The test comprises three parts that are carried out consecutively for each brake system:

(1) A baseline test using the dry stop test—single brake control actuated (S6.3).

(2) A heating procedure which consists of a series of repeated stops in order to heat the brake(s).

(3) A hot brake stop using the dry stop test—single brake control actuated (S6.3), to measure the brake's performance after the heating procedure.

(b) The test is applicable to motorcycle categories 3–3, 3–4 and 3–5.

(c) The test is not applicable to parking brake systems and secondary service brake systems.

(d) All stops are carried out with the motorcycle laden.

(e) The heating procedure requires the motorcycle to be fitted with instrumentation that gives a continuous recording of brake control force and vehicle deceleration.

S6.7.2 *Baseline test.*

S6.7.2.1 *Vehicle condition—baseline test.* Engine disconnected.

S6.7.2.2 *Test conditions and procedure—baseline test.*

(a) *Initial brake temperature.* Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(b) *Test speed.* Test speed is 60 km/h or 0.9 Vmax, whichever is the lower.

(c) *Brake application.* Each service brake system control is actuated separately.

(d) *Brake actuation force.*

(1) Hand control: ≤ 200 N.

(2) Foot control:

(i) ≤ 350 N for motorcycle categories 3–3 and 3–4.

(ii) ≤ 500 N for motorcycle category 3–5.

(e) Accelerate the vehicle to the test speed, actuate the brake control under the conditions specified and record the control force required to achieve the vehicle braking performance specified in the table to S6.3.3 (Table 2).

S6.7.3 *Heating procedure.*

S6.7.3.1 *Vehicle condition—heating procedure.* Engine transmission:

(a) From the specified test speed to 50 per cent specified test speed: connected, with the highest appropriate gear selected such that the engine speed remains above the manufacturer's specified idle speed.

(b) From 50 per cent specified test speed to standstill: disconnected.

S6.7.3.2 *Test conditions and procedure—heating procedure.*

(a) *Initial brake temperature.* Initial brake temperature is (prior to first stop only) ≥ 55 °C and ≤ 100 °C.

(b) *Test speed.*

(1) Single brake system, front wheel braking only: 100 km/h or 0.7 Vmax, whichever is the lower.

(2) Single brake system, rear wheel braking only: 80 km/h or 0.7 Vmax, whichever is the lower.

(3) CBS or split service brake system: 100 km/h or 0.7 Vmax, whichever is the lower.

(c) *Brake application.* Each service brake system control actuated separately.

(d) *Brake actuation force.*

(1) For the first stop: The constant control force that achieves a vehicle deceleration rate of 3.0—3.5 m/s^2 while the vehicle is decelerating between 80 percent and 10 percent of the specified speed.

(2) For the remaining stops:

(i) The same constant brake control force as used for the first stop.

(ii) Number of stops: 10.

(iii) Interval between stops: 1000 m.

(e) Carry out a stop to the conditions specified in this paragraph and then immediately use maximum acceleration to reach the specified speed and maintain that speed until the next stop is made.

S6.7.4 *Hot brake stop—test conditions and procedure.* Perform a single stop under the conditions used in the baseline test (S6.7.2) for the brake system that has been heated during the procedure in accordance with S6.7.3. This stop is carried out within one minute of the completion of the procedure set out in S6.7.3 with a brake control application force less than or equal to the force used during the test set out in S6.7.2.

S6.7.5 *Performance requirements.* When the brakes are tested in accordance with the test procedure set out in S6.7.4, the stopping distance S_2 shall be $\leq 1.67\ S_1 - 0.67 \times 0.1V$,

Where:

S_1 = corrected stopping distance in meters achieved in the baseline test set out in S6.7.2.

S_2 = corrected stopping distance in meters achieved in the hot brake stop set out in S6.7.4.

V = specified test speed in km/h.

S6.8 *Parking brake system test—for motorcycles with parking brakes.*

S6.8.1 *Vehicle condition.*

(a) The test is applicable to motorcycle categories 3–2, 3–4 and 3–5.

(b) Laden.

(c) Engine disconnected.

S6.8.2 *Test conditions and procedure.*

(a) *Initial brake temperature.* Initial brake temperature is ≤ 100 °C.

(b) *Test surface gradient.* Test surface gradient is equal to 18 percent.

(c) *Brake actuation force.*

(1) Hand control: ≤ 400 N.

(2) Foot control: ≤ 500 N.

(d) For the first part of the test, park the vehicle on the test surface gradient facing up the slope by applying the parking brake system under the conditions specified in this paragraph. If the vehicle remains stationary, start the measurement of the test period.

(e) The vehicle must remain stationary to the limits of traction of the braked wheels.

(f) On completion of the test with vehicle facing up the gradient, repeat the same test procedure with the vehicle facing down the gradient.

S6.8.3 *Performance requirements.* When tested in accordance with the test procedure set out in S6.8.2, the parking brake system shall hold the vehicle stationary for 5 minutes when the vehicle is both facing up and facing down the gradient.

S6.9 *ABS tests.*

S6.9.1 *General.*

(a) The tests are only applicable to the ABS fitted on motorcycle categories 3–1 and 3–3.

(b) The tests are to confirm the performance of brake systems equipped with ABS and their performance in the event of ABS electrical failure.

(c) *Fully cycling* means that the anti-lock system is repeatedly modulating the brake force to prevent the directly controlled wheels from locking.

(d) Wheel-lock is allowed as long as the stability of the vehicle is not affected to the extent that it requires the operator to release the control or causes a vehicle wheel to pass outside the test lane.

(e) The test series comprises the individual tests in Table 3, which may be carried out in any order.

S6.9.2 *Vehicle condition.*

(a) Lightly loaded.

(b) Engine disconnected.

S6.9.3 *Stops on a high friction surface.*

S6.9.3.1 *Test conditions and procedure.*

(a) *Initial brake temperature.* Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(b) *Test speed.* Test speed is 60 km/h or 0.9 Vmax, whichever is lower.

(c) *Brake application.* Simultaneous actuation of both service brake system controls, if so equipped, or of the single service brake control in the case of a service brake system that operates on all wheels.

(d) *Brake actuation force.* The force applied is that which is necessary to ensure that the ABS will cycle fully throughout each stop, down to 10 km/h.

(e) If one wheel is not equipped with ABS, the control for the service brake on that wheel is actuated with a force that is lower than the force that will cause the wheel to lock.

(f) Number of stops: until the vehicle meets the performance requirements, with a maximum of 6 stops.

(g) For each stop, accelerate the vehicle to the test speed and then actuate the brake control under the conditions specified in this paragraph.

S6.9.3.2 *Performance requirements.* When the brakes are tested in accordance with the test procedures referred to in S6.9.3.1:

(a) The stopping distance (S) shall be ≤ $0.0063\,V^2$ (where V is the specified test speed in km/h and S is the required stopping distance in meters); and

(b) there shall be no wheel lock beyond that allowed for in paragraph S6.9.1(d), and the vehicle wheels shall stay within the test lane.

S6.9.4 *Stops on a low friction surface.*

S6.9.4.1 *Test conditions and procedure.* As set out in S6.9.3.1, but using the low friction surface instead of the high friction one.

S6.9.4.2 *Performance requirements.* When the brakes are tested in accordance with the test procedures set out in S6.9.4.1:

(a) the stopping distance (S) shall be ≤ $0.0056\ V^2/P$ (where V is the specified test speed in km/h, P is the peak braking coefficient and S is the required stopping distance in meters); and

(b) there shall be no wheel lock beyond that allowed for in paragraph S6.9.1(d), and the vehicle wheels shall stay within the test lane.

S6.9.5 *Wheel lock checks on high and low friction surfaces.*

S6.9.5.1 *Test conditions and procedure.*

(a) *Test surfaces.* High friction or low friction surface, as applicable.

(b) *Initial brake temperature.* Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(c) *Test speed.*

(1) On the high friction surface: 80 km/h or 0.8 Vmax, whichever is lower.

(2) On the low friction surface: 60 km/h or 0.8 Vmax, whichever is lower.

(d) *Brake application.*

(1) Each service brake system control actuated separately.

(2) Where ABS is fitted to both brake systems, simultaneous actuation of both brake controls in addition to (1).

(e) *Brake actuation force.* The force applied is that which is necessary to ensure that the ABS will cycle fully throughout each stop, down to 10 km/h.

(f) *Brake application rate.* The brake control actuation force is applied in 0.2–0.5 seconds.

(g) Number of stops: until the vehicle meets the performance requirements, with a maximum of 3 stops.

(h) For each stop, accelerate the vehicle to the test speed and then actuate the brake control under the conditions specified in this paragraph.

S6.9.5.2 *Performance requirements.* When the brakes are tested in accordance with the test procedures set out in S6.9.5.1, there shall be no wheel lock beyond that allowed for in paragraph S6.9.1(d), and the vehicle wheels shall stay within the test lane.

S6.9.6 *Wheel lock check—high to low friction surface transition.*

S6.9.6.1 *Test conditions and procedure.*

(a) *Test surfaces.* A high friction surface immediately followed by a low friction surface.

(b) *Initial brake temperature.* Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(c) *Test speed.* The speed that will result in 50 km/h or 0.5 Vmax, whichever is the lower, at the point where the vehicle passes from the high friction to the low friction surface.

(d) *Brake application.*

(1) Each service brake system control actuated separately.

(2) Where ABS is fitted to both brake systems, simultaneous actuation of both brake controls in addition to (1).

(e) *Brake actuation force.* The force applied is that which is necessary to ensure that the ABS will cycle fully throughout each stop, down to 10 km/h.

(f) Number of stops: until the vehicle meets the performance requirements, with a maximum of 3 stops.

(g) For each stop, accelerate the vehicle to the test speed and then actuate the brake control before the vehicle reaches the transition from one friction surface to the other.

S6.9.6.2 *Performance requirements.* When the brakes are tested in accordance with the test procedures set out in S6.9.6.1, there shall be no wheel lock beyond that allowed for in paragraph S6.9.1(d), and the vehicle wheels shall stay within the test lane.

S6.9.7 *Wheel lock check—low to high friction surface transition.*

S6.9.7.1 *Test conditions and procedure.*

(a) *Test surfaces.* A low friction surface immediately followed by a high friction surface with a PBC ≥ 0.8.

(b) *Initial brake temperature.* Initial brake temperature is ≥55 °C and ≤100 °C.

(c) *Test speed.* The speed that will result in 50 km/h or 0.5 Vmax, whichever is the lower,

at the point where the vehicle passes from the low friction to the high friction surface.

(d) *Brake application*.

(1) Each service brake system control applied separately.

(2) Where ABS is fitted to both brake systems, simultaneous application of both brake controls in addition to (1).

(e) *Brake actuation force*. The force applied is that which is necessary to ensure that the ABS will cycle fully throughout each stop, down to 10 km/h.

(f) Number of stops: until the vehicle meets the performance requirements, with a maximum of 3 stops.

(g) For each stop, accelerate the vehicle to the test speed and then actuate the brake control before the vehicle reaches the transition from one friction surface to the other.

(h) Record the vehicle's continuous deceleration.

S6.9.7.2 *Performance requirements*. When the brakes are tested in accordance with the test procedures set out in S6.9.7.1:

(a) There shall be no wheel lock beyond that allowed for in paragraph S6.9.1(d), and the vehicle wheels shall stay within the test lane, and

(b) within 1 second of the rear wheel passing the transition point between the low and high friction surfaces, the vehicle deceleration shall increase.

S6.9.8 *Stops with an ABS electrical failure*.

S6.9.8.1 *Test conditions and procedure*. With the ABS electrical system disabled, carry out the test set out in S6.3 (dry stop test—single brake control actuated) applying the conditions relevant to the brake system and vehicle being tested.

S6.9.8.2 *Performance requirements*. When the brakes are tested in accordance with the test procedure set out in S6.9.8.1:

(a) The system shall comply with the failure warning requirements of S5.1.10.2; and

(b) the minimum requirements for stopping distance shall be as specified in column 2 under the heading ''Single brake system, rear wheel(s) braking only'' in Table 2.

S6.10 *Partial failure test—for split service brake systems*.

S6.10.1 *General information*.

(a) The test is only applicable to vehicles that are equipped with split service brake systems.

(b) The test is to confirm the performance of the remaining subsystem in the event of a hydraulic system leakage failure.

S6.10.2 *Vehicle condition*.

(a) The test is applicable to motorcycle categories 3–3, 3–4 and 3–5.

(b) Lightly loaded.

(c) Engine disconnected.

S6.10.3 *Test conditions and procedure*.

(a) *Initial brake temperature*. Initial brake temperature is ≥ 55 °C and ≤ 100 °C.

(b) *Test speed*. Test speed is 50 km/h and 100 km/h or 0.8 Vmax, whichever is lower.

(c) Brake actuation force.

(1) Hand control: ≤ 250 N.

(2) Foot control: ≤ 400 N.

(d) Number of stops: until the vehicle meets the performance requirements, with a maximum of 6 stops for each test speed.

(e) Alter the service brake system to induce a complete loss of braking in any one subsystem. Then, for each stop, accelerate the vehicle to the test speed and then actuate the brake control under the conditions specified in this paragraph.

(f) Repeat the test for each subsystem.

S6.10.4 *Performance requirements*. When the brakes are tested in accordance with the test procedure set out in S6.10.3:

(a) the system shall comply with the failure warning requirements set out in paragraph S5.1.10.1; and

(b) the stopping distance (S) shall be $\leq 0.1\ V + 0.0117\ V^2$ (where V is the specified test speed in km/h and S is the required stopping distance in meters).

S6.11 *Power-assisted braking system failure test*.

S6.11.1 *General information*.

(a) The test is not conducted when the vehicle is equipped with another separate service brake system.

(b) The test is to confirm the performance of the service brake system in the event of failure of the power assistance.

S6.11.2 *Test conditions and procedure*. Carry out the test set out in S6.3.3 (dry stop test—single brake control actuated) for each service brake system with the power assistance disabled.

S6.11.3 *Performance requirements*. When the brakes are tested in accordance with the test procedure set out in S6.11.2, the stopping distance shall be as specified in column 2 of Table 4. Note that if the power assistance may be activated by more than one control, the above performance shall be achieved when each control is actuated separately.

TABLES AND FIGURES TO § 571.122

TABLE 1—TEST SEQUENCE

Test order	Paragraph
1. Dry stop—single brake control actuated	S6.3
2. Dry stop—all service brake controls actuated	S6.4
3. High speed	S6.5
4. Wet brake	S6.6
5. If fitted:	
6.1. Parking brake system	S6.8
6.2. ABS	S6.9
6.3. Partial failure, for split service brake systems	S6.10
6.4. Power-assisted braking system failure	S6.11
6. Heat fade	S6.7

TABLE 2—PERFORMANCE REQUIREMENTS, DRY STOP TEST—SINGLE BRAKE CONTROL ACTUATED

Column 1	Column 2
Motorcycle category	Stopping Distance(s) (where V is the specified test speed in km/h and S is the required stopping distance in meters)
Single brake system, front wheel(s) braking only	
3–1	$S \leq 0.1\ V + 0.0111\ V^2$.
3–2	$S \leq 0.1\ V + 0.0143\ V^2$.
3–3	$S \leq 0.1\ V + 0.0087\ V^2$.
3–4	$S \leq 0.1\ V + 0.0105\ V^2$.
3–5	Not applicable.
Single brake system, rear wheel(s) braking only	
3–1	$S \leq 0.1\ V + 0.0143\ V^2$.
3–2	$S \leq 0.1\ V + 0.0143\ V^2$.
3–3	$S \leq 0.1\ V + 0.0133\ V^2$.
3–4	$S \leq 0.1\ V + 0.0105\ V^2$.
3–5	Not applicable.
Vehicles with CBS or split service brake systems: For laden and lightly loaded conditions	
3–1 and 3–2	$S \leq 0.1\ V + 0.0087\ V^2$.
3–3	$S \leq 0.1\ V + 0.0076\ V^2$.
3–4	$S \leq 0.1\ V + 0.0071\ V^2$.
3–5	$S \leq 0.1\ V + 0.0077\ V^2$.
Vehicles with CBS—secondary service brake system	
ALL	$S \leq 0.1\ V + 0.0154\ V^2$.

TABLE 3—ABS TESTS

ABS Tests	Paragraph
a. Stops on a high friction surface—as specified in S6.1.1.1	S6.9.3
b. Stops on a low friction surface—as specified in S6.1.1.2	S6.9.4
c. Wheel lock checks on high and low friction surfaces	S6.9.5
d. Wheel lock check—high to low friction surface transition	S6.9.6
e. Wheel lock check—low to high friction surface transition	S6.9.7
f. Stops with an ABS electrical failure	S6.9.8

TABLE 4—PERFORMANCE REQUIREMENTS, POWER-ASSISTED BRAKING SYSTEM FAILURE TEST

Column 1	Column 2
Vehicle category	Stopping Distance(s) (where V is the specified test speed in km/h and S is the required stopping distance in meters)
Single brake system	
3–1	$S \leq 0.1\ V + 0.0143\ V^2$.
3–2	$S \leq 0.1\ V + 0.0143\ V^2$.
3–3	$S \leq 0.1\ V + 0.0133\ V^2$.
3–4	$S \leq 0.1\ V + 0.0105\ V^2$.
Vehicles with CBS or split service brake systems	
All	$S \leq 0.1\ V + 0.0154\ V^2$.

Figure 1. Hand control lever force application points and direction.

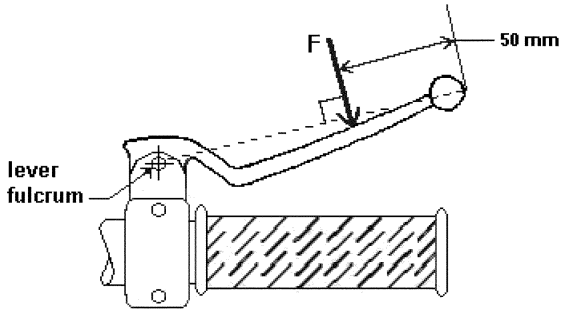


Figure 2. Typical Plug Type Thermocouple Installations

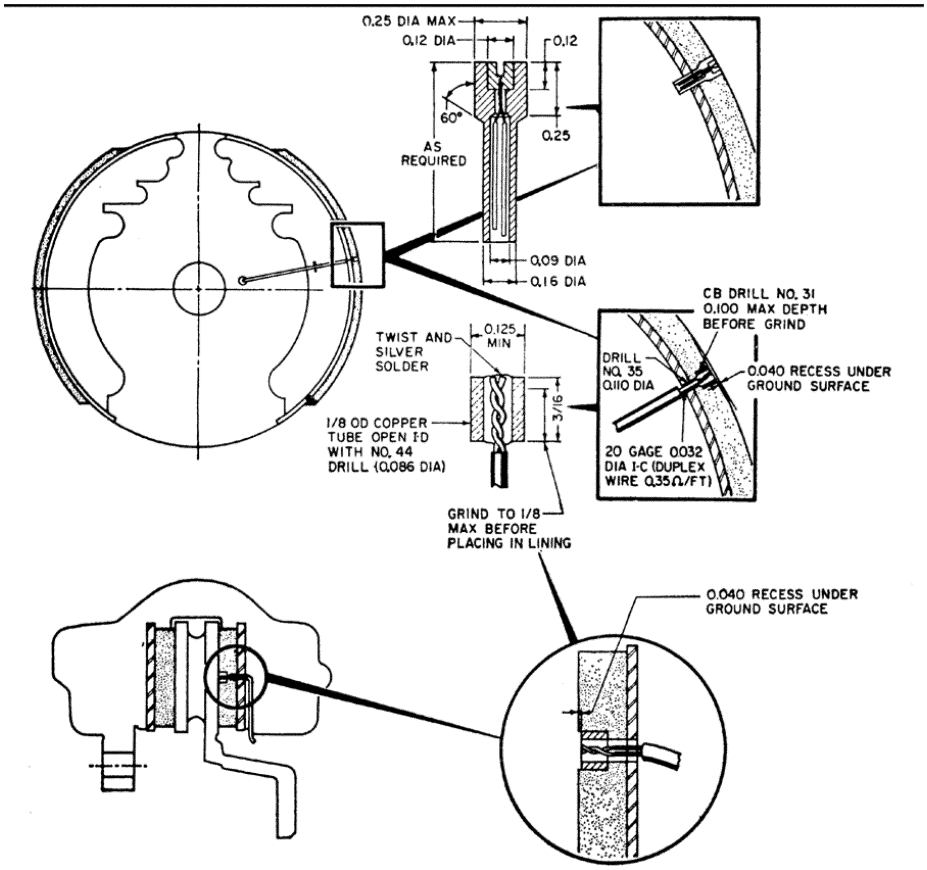
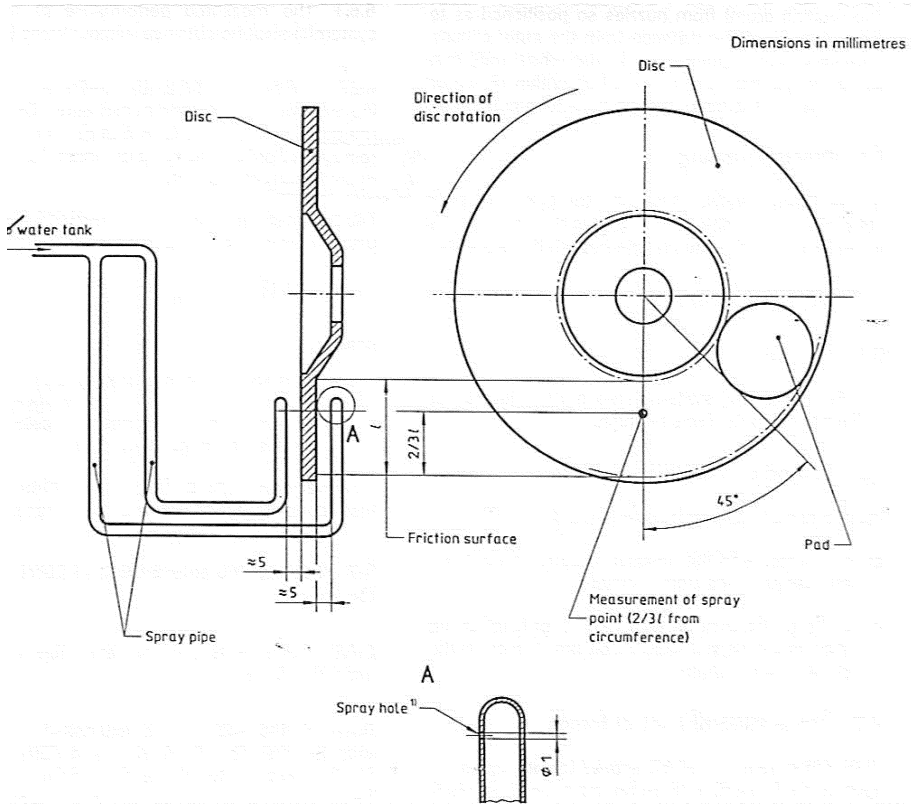


Figure 3. Wet brake test.



§571.123 Standard No. 123; Motorcycle controls and displays.

S1. *Scope.* This standard specifies requirements for the location, operation, identification, and illumination of motorcycle controls and displays, and requirements for motorcycle stands and footrests.

S2. *Purpose.* The purpose of this standard is to minimize accidents caused by operator error in responding to the motoring environment, by standardizing certain motorcycle controls and displays.

S3. *Application.* This standard applies to motorcycles equipped with handlebars, except for motorcycles that are designed, and sold exclusively for use by law enforcement agencies.

S4. *Definitions.* *Clockwise* and *counterclockwise* mean opposing directions of rotation around the following axes, as applicable.

(a) The operational axis of the ignition control, viewed from in front of the ignition lock opening;

(b) The axis of the right handlebar on which the twist-grip throttle is located, viewed from the end of that handlebar;

(c) The axis perpendicular to the center of the speedometer, viewed from the operator's normal eye position.

Scooter means a motorcycle that:

(1) Has a platform for the operator's feet or has integrated footrests, and

(2) Has a step-through architecture, meaning that the part of the vehicle