



SURFACE VEHICLE RECOMMENDED PRACTICE

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(R) Motorcycle Classifications

RATIONALE

This document has been revised as follows:

- Substantial changes were made throughout the document.

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1. SCOPE

This SAE Recommended Practice provides uniform definitions and classifications for motorcycles and motorized three-wheel cycles.

1.1 Purpose

This SAE Recommended Practice was prepared for use by those with a need to systematically classify motorcycles. Generally, federal, state, and local agencies determine regulations and requirements for motorcycles based on specific classes, categories, engine displacement, motive type, type, output power, or potential speed capabilities. Other entities may rely on this document for reporting or research, such as accident investigations, police reports, sales and marketing reports, and other uses that analyze or define data based on those differentiators listed and other criteria including motive propulsion or fuel type, style, or market niche.

This report was prepared by the SAE Motorcycle Technical Steering Committee, which solicits suggestions for improvements and additions to be considered in future revisions. Comments should be directed to SAE Headquarters.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1451 A Dictionary of Terms for the Dynamics and Handling of Single Track Vehicles (Motorcycles, Scooters, Mopeds, and Bicycles)

SAE J3133 Motorcycle Terminology

2.1.2 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 7117:1995(E) Motorcycles - Measurement of maximum speed

2.1.3 Other Publications

U.S. Federal Motor Vehicle Safety Standards (FMVSS)

Canadian Motor Vehicle Safety Standards (CMVSS)

3. DEFINITIONS

3.1 AUTOCYCLE

A three-wheel motorcycle that has a steering wheel and seating that does not require the operator to straddle or sit astride it. These vehicles are referred to as autocycles by the American Association of Motor Vehicle Administrators (AAMVA) and the National Conference of State Legislatures (NCSL). Autocycles are not covered in this document.

3.2 BRAKE HORSEPOWER

An engine's power output measured at the crankshaft before the loss in power caused by frictional losses in the transmission's and drive train's bearings, gears, oil drag, windage, etc. (refer to SAE J3133).

3.3 CATEGORY

For motorcycle classification purposes, the general purpose and intended usage for which the motorcycle is designed and equipped. There are five primary categories: on-road, restricted-use, dual purpose, off-road, and competition.

3.4 CUBIC CENTIMETERS or CC

A metric measure of volume commonly used for cylinder displacement in internal combustion engines. Cylinder displacement times the number of cylinders equals the nominal engine size (refer to SAE J3133).

3.5 CONFIGURATION

For motorcycle classification purposes, configuration includes number of wheels in contact with the ground, whether the wheels are arrayed in symmetric or asymmetric design, whether the vehicle banks-to-turn or steers-to-turn, number of wheel tracks, whether the vehicle steering occurs with the front or rear wheels, and rider and passenger capacity.

3.6 CURB WEIGHT

The total weight of the motorcycle including all operating fluids, at recommended levels and fuel level of more than 90% of rated capacity, but without operator, passengers, or cargo (refer to SAE J1451).

3.7 DIRT BIKE (MOTORCYCLE)

A generalized term for any off-road only motorcycle. See OFF-ROAD MOTORCYCLE.

3.8 ENCLOSED MOTORCYCLE

A motorcycle with a structure partially or fully enclosing the rider and passenger and that is an integral part of the motorcycle chassis.

3.9 ENGINE DISPLACEMENT

The volume swept by all the pistons inside the cylinders of a reciprocating engine in a single movement from top dead center (TDC) to bottom dead center (BDC). It is commonly measured in cubic centimeters (cc), or in cubic inches mainly in North America (refer to SAE J3133).

3.10 LONGITUDINAL PLANE OF SYMMETRY

For a two-wheeled vehicle: The plane which bisects the front wheel and rear wheel with the steering centered and is parallel to the longitudinal and vertical axes. This assumes the vehicle is nominally symmetric left and right (refer to SAE J1451).

For a three-wheeled vehicle: For an upright and symmetrical vehicle configuration with the steering centered, the plane which bisects the single wheel and the midpoint between the two wheels sharing the same axis of rotation and is parallel to the longitudinal and vertical axes (refer to SAE J1451).

3.11 MOTORCYCLE

A motorized two-wheel, single track vehicle that is roll-to-turn with an auto-stabilizing front steering assembly and has a handlebar for steering, a hand operated throttle control, and a straddle seat for the use of the rider. See MOTORIZED THREE-WHEELED CYCLE (refer to SAE J3133).

3.12 MOTORIZED THREE-WHEELED CYCLE

In the case of a conventional three-wheel configuration, a motorized three-wheel, three track vehicle that is steer-to-turn with an auto-stabilizing front steering assembly, with a single front wheel and two rear wheels arrayed symmetrical to the longitudinal axis, and has a handlebar for steering, a hand operated throttle control, and a straddle seat for the use of the rider.

In the case of an unconventional three-wheel configuration, a motorized three-wheel, three track vehicle that is steer-to-turn with two front steered wheels arrayed symmetrical to the longitudinal axis and a single rear drive wheel in nominal symmetry to the vehicle centerline and has a handlebar for steering, a hand operated throttle control, and a straddle seat for the use of the rider (refer to SAE J3133).

3.13 MOTOR TRICYCLE (Canada)

A motorized cycle designed to travel on three wheels and has a straddle seat for the use of the rider and passenger (refer to CMVSS).

3.14 OFF-ROAD MOTORCYCLE

A motorcycle designed and equipped for operation on unimproved terrain. Off-road motorcycles are not designed or equipped to meet federal safety and emissions requirements and state regulations for legal operation on public roads and highways but must comply with federal off-road exhaust emission requirements.

3.15 OPEN MOTORCYCLE (Canada)

A motorcycle that has steering handlebars, is designed to travel on two wheels in contact with the ground, has a minimum driver's seat height, when the vehicle is unladen, of 25.5 inches (650 mm), has a maximum speed of more than 43 mph (70 km/h), and does not have a structure partially or fully enclosing the driver and passenger that is an integral part of the vehicle chassis (refer to CMVSS).

3.16 PERFORMANCE CAPABILITY

For motorcycle classification purposes, performance capability includes vehicle horsepower, measured in brake horsepower (bhp), vehicle top speed measured in miles per hour (mph) or kilometers per hour (km/h), engine displacement measured in cubic centimeters (cc), and electrical motor output measured in kilowatts (kW) (refer to SAE J3133).

3.17 SIDECAR

A structure containing a third wheel which attaches asymmetrically to the side of a two-wheeled motorcycle, having a seat or a platform, generally for the purpose of transporting persons or property.

3.18 STEP THROUGH

A design, used primarily for scooters and mopeds, in which the engine is mounted behind or directly below the rider's seat. This configuration allows a rider to mount or dismount by stepping over or across the part of the vehicle forward of the operator's seat. These designs have an upright riding position with the foot pegs, pedals, or floorboards, positioned below and in front of the rider's body (refer to SAE J3133).

3.19 STREET BIKE OR MOTORCYCLE

See 5.1.

3.20 STREET LEGAL BIKE OR MOTORCYCLE

See 5.1.

3.21 THREE-WHEEL MOTORCYCLE

See MOTORIZED THREE-WHEELED CYCLE.

3.22 THREE-WHEEL VEHICLE

A sit-in vehicle typically equipped with a bucket seat or seats and restraints, a steering wheel, and driver controls that are located and operated similar to the controls in an automobile. Some have doors and a roof. While a single rear driving wheel maybe suspended by a swing arm and utilize a chain drive, other features and characteristic differentiate this vehicle from conventional motorcycle design (refer to SAE J3133).

3.23 TRAIL BIKE

A generalized term for a recreational off-road motorcycle.

3.24 TYPE

For motorcycle classification purposes, type describes the marketing category or layout, "look," style, and features of specific model groups (refer to SAE J3133).

3.25 $V_{\max}$

Maximum velocity, 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 (refer to ISO 7117:1995[E] and FMVSS).

4. CONFIGURATIONS

4.1 Conventional Configurations

4.1.1 Conventional Two-Wheeled Motorcycle

A motorized two-wheel, single track vehicle, which leans-to-turn with an auto-stabilizing front steering assembly.

4.1.2 Conventional Motorcycle with Sidecar

A structure containing a third wheel, having a seat or a platform, which attaches asymmetrically to either side of a conventional two-wheeled motorcycle.

4.2 Unconventional Configurations

4.2.1 Motorized Three-Wheel Cycle (Trike)

A motorized three-wheel, three track vehicle, which steers-to-turn with an auto-stabilizing front steering assembly, with a single front wheel and two rear wheels arrayed symmetrical to the longitudinal axis, and has a handlebar for steering, a hand operated throttle control, and a straddle seat for the use of the rider (refer to SAE J1451).

4.2.2 Unconventional Motorized Three-Wheel Cycle

A motorized three-wheel, three track vehicle, which steers-to-turn with two front steered wheels arrayed symmetrical to the longitudinal axis and a single rear drive wheel, and has a handlebar for steering, a hand operated throttle control, and a straddle seat for the use of the rider.

4.2.3 Three-Wheel Vehicle

A sit-in vehicle that is typically equipped with bucket or bench seats and occupant restraints, a steering wheel, and driver controls that are located and operated similar to the controls in an automobile. Some have doors and a roof. While a single rear driving wheel may be suspended by a swing arm and utilize a chain drive, other features and characteristics differentiate this vehicle from conventional motorcycle designs (refer to SAE J3133).

5. CATEGORIES OF MOTORCYCLES USAGE

5.1 On-Road Motorcycle

A motorcycle that is designed and equipped to meet federal motor vehicle safety and emissions requirements and state regulations for legal operation on public roads and highways.

5.2 Restricted-Use Motorcycles or Scooters

These vehicles have limited performance capability and use is restricted to certain speed limited roads, and operation on high-speed highways is not allowed. A motorcycle in this category may be exempt from certain federal and state licensing, equipment, insurance, helmet laws, and emission requirements. See 6.2.1.

5.3 Dual Purpose

Designed for most types of terrain, the name describes an on-road motorcycle that is equipped to meet federal equipment, safety, and emission requirements and state regulations for legal operation on public roads and highways and also has off-road capabilities (refer to SAE J3133).

5.4 Off-Road Motorcycle

A motorcycle designed and equipped for operation on unimproved terrain. While this category must comply with federal off-road exhaust emission requirements, off-road motorcycles are not designed or equipped to meet federal safety requirements (FMVSS) or on-highway emissions requirements or state regulations for legal operation on public roads and highways (refer to SAE J3133).

5.5 Competition Motorcycle

A motorcycle designed and equipped to operate in a competitive event. Some motorcycles are marketed and sold as "Competition Only," meaning that those models are intended for operation on a closed or designated course in competitive event and generally cannot be used on public roads or for recreational off-road riding as these models do not comply with federal equipment, safety, exhaust emission, and noise regulations (refer to SAE J3133).

6. TYPES/STYLES OF TWO-WHEEL MOTORCYCLES

6.1 On-Road Motorcycles

6.1.1 Standard/Conventional (Traditional)

A conventional on-road motorcycle configuration with telescopic forks in the front, a rear swing arm with one or two dampers in the rear, a frame mounted gas tank located between the handlebars, and seat for the operator and generally a passenger.

6.1.2 Touring

A motorcycle designed for long distance riding, typically a heavier bike with a windshield, hard-sided luggage bags, and comfortable seating arrangements. These models feature an upright riding position with foot pegs positioned below rider's body.

6.1.3 Cruiser

A laid-back styled on-road motorcycle intend primarily for boulevard cruising with the motorcycle's appearance considered as important as performance. These decedents of customized choppers offer factory-built reliability and warranty, with a classic modified look characterized by low seat and swept back handlebars, an engine tuned to emphasize torque, with a strong exhaust note and an abundance of chrome. The models generally have an upright or rearward-inclined riding position with foot pegs positioned forward.

6.1.4 Custom

An on-road motorcycle with stylistic and/or structural changes to the "standard" mass-produced models offered by major manufacturers. There are two basic types of custom motorcycles: those individual motorcyclists have altered the appearance of their machines or have modified by custom motorcycle builders or shops, and "Custom" models produced by major motorcycle manufacturers. The factory custom segment has become the most visible in the custom industry in recent years.

6.1.5 Chopper

A generic term for a customized motorcycle with a specific style and design, usually the result of aftermarket modification. A popular chopper style typically features lengthened forks and increased rake angles, while other styles use normal fork lengths and rake angles. Choppers generally have modified suspension, a small front tire and a wide rear tire, a lowered seating position, and a modified exhaust system. The usual rider's position is rearward-inclined with foot pegs positioned forward.

6.1.6 Moped

A type of lightweight, low speed, motorized, two-wheel, single track, bank to turn vehicle with an auto-stabilizing front steering assembly that generally has a maximum design speed not exceeding 30 mph (50 km/h) and/or an engine displacement of 50 cc or less. Mopeds were once equipped with bicycle-like pedals (the source of the term, motor + pedal) to assist the low-power engine when starting or climbing hills. The term "moped" has been increasingly applied by governments to vehicles without pedals but having restricted engine displacement or top speed, and/or power output. Although mopeds usually have two wheels, some jurisdictions classify all low-powered three- or four-wheeled motorized cycles as mopeds.

6.1.7 Motor-Driven Cycle

A motorcycle with a motor that produces 5-brake horsepower or less (refer to FMVSS 122).

6.1.8 Scooter

A two- or three-wheel cycle having the engine as an integral part of the rear swing arm assembly, and with a platform or integrated footrests for the operator's feet. Typically, a step-through architecture, meaning that the part of the vehicle forward of the operator's seat and between the legs of an operator seated in the riding position, is lower in height than the operator's seat. Such models have an upright riding position, and typically the operator's feet rest on a floorboard located in front and to the sides of the seat. Larger scooters with larger engine displacement (greater than 175 cc in some states) may be capable of highway speeds (greater than 45 mph).

6.1.9 Sports

An on-road motorcycle designed with an emphasis on outstanding acceleration, speed, and handling characteristics. Characterized by leading edge, high-RPM engine design, the application of racing technology, aerodynamic styling, low handlebars, high performance disc brakes, tires and suspension, and overall low weight. The models have a forward inclined riding position with foot pegs positioned below or slightly rearward of the rider's body but typically higher or closer to the rider's body for improved ground clearance when cornering. Generally, these models are not designed to carry cargo or luggage.

6.1.10 Super Sports

A high-performance on-road motorcycle similar to sport model but with greater performance capabilities. These models generally have more powerful engines, lighter weight, higher performance braking and suspension with greater adjustability, and other performance enhancements.

6.1.11 Sports Touring

A high-performance on-road motorcycle that combines the comfort and carrying capacity of a touring bike with the handling and power of a sport bike. Usually equipped with a fairing and hard-sided, lockable luggage.

6.2 Restricted-Use Motorcycle

6.2.1 Exempt Scooter

A lightweight, low speed scooter that generally has a maximum design speed not exceeding 30 mph (50 km/h) and/or an engine displacement of 50 cc or less and their use is restricted to certain speed limited roads, and operation on high-speed highways is not allowed. Scooters in this category may be exempt from certain federal and state, province or territorial licensing, insurance, equipment, helmet, or emission requirements. See 5.2.

6.2.2 Motor-Driven Cycle

A motorcycle with a motor that produces 5-brake horsepower or less. Some states and local jurisdictions limit or restrict operation to certain roads or areas.

6.3 Dual Purpose Motorcycle

6.3.1 Dual Purpose/Sport

Designed for most types of terrain, the name describes an on-road motorcycle that is equipped to meet federal equipment, safety, and emission requirements and state regulations for legal operation on public roads and highways and also has off-road capabilities.

6.3.2 Adventure

An on-road model that is equipped to meet federal equipment, safety, and emission requirements and state regulations for legal operation on public roads and highways and also has off-road capabilities. Typically, dual purpose models are based on an off-road motorcycle chassis with higher ground clearance, longer suspension travel, tires with aggressive patterns and deep treads for grip on dirt surfaces, and a taller seat height. These models have an upright riding position with foot pegs positioned below or slightly forward of the rider's body.

6.3.3 Adventure Touring

A dual-purpose motorcycle that is equipped to meet federal equipment, safety, and emission requirements and state regulations for legal operation on public roads and highways and also has off-road capabilities. Similar to an Adventure model, the touring models are typically larger, heavier, and equipped with a more powerful engine for sustained high speed riding on paved surfaces and have cargo storage and increased load capacity.

6.4 Off-Road Motorcycle

6.4.1 Enduro

An off-road racing motorcycle used in endurance racing (enduros). These models typically combine the long-travel suspension of an off-road motocross bike with an engine that is reliable and durable over long distances, and some may be fitted with oversize gas tanks for adequate range. On-road versions of this model are dual purpose motorcycles.

6.4.2 Off-Road Bike

A motorcycle designed and equipped for operation on unimproved terrain. While this category must comply with federal off-road exhaust emission requirements, off-road motorcycles are not designed or equipped to meet federal safety and on-road emissions requirements or state regulations for legal operation on public roads and highways.

6.4.3 Trail Bike

A generalized term for a recreational off-road motorcycle.

6.4.4 Pocket Bike

These are physically small bikes that are designed to look like sport bikes. The usual height is less than 20 inches (50 cm) and up to 3 feet 3 inches (1 m) length. Maximum speed varies between 19 and 40 mph (30 and 64 km/h). Pocket bikes are typically equipped with either small displacement engines with a maximum of 4.5 to 6 horsepower (3.4 to 4.5 kW), or battery-powered electric motors.

6.5 Competition Only

6.5.1 Motocross

An off-road racing motorcycle used in motocross and supercross racing. Motocross bikes are relatively lightweight with quick accelerating engines and long-travel suspension.

6.5.2 Supermoto/Motard

An off-road competition motorcycle designed or modified to race in supermoto events. Generally, a motocross bike converted to race on both dirt and pavement. The bikes are fitted with special road-racing tires with grooving to grip on both the pavement and dirt.

6.5.3 Trials

An off-road model designed and intended to be used exclusively for competition over radical, rough terrain. Trials motorcycles are extremely lightweight, with low gear ratios, high ground clearance, and a control layout suited for a rider standing up on the foot pegs.

6.5.4 Road Racer

A highly modified or purpose-built competition motorcycle for racing on paved road racing tracks or courses.

7. TYPES OF THREE-WHEEL MOTORCYCLES AND MOTORIZED THREE-WHEEL CYCLES

7.1 On-Road Three-Wheel Motorcycles and Motorized Three-Wheel Cycles

On road motorcycle configured as a conventional motorcycle with side car, motorized three-wheeled cycle (trike), or unconventional motorized three-wheeled cycle.

7.2 Restricted-Use Three-Wheel Motorcycles and Motorized Three-Wheel Cycles

Restricted-use motorcycle configured as a conventional motorcycle having a side car, motorized three-wheeled cycle (trike), or unconventional motorized three-wheeled cycle.

7.3 Off-Road Three-Wheel Motorcycles and Motorized Three-Wheel Cycles

Off-road motorcycle configured as a conventional motorcycle with side car, motorized three-wheeled cycle (trike), or unconventional motorized three-wheeled cycle. All terrain cycles (ATC) are obsolete examples of this type.

7.4 Competition Three-Wheel Motorcycles and Motorized Three-Wheel Cycles

Competition motorcycle configured as a conventional motorcycle having a side car, motorized three-wheeled cycle (trike), or unconventional motorized three-wheeled cycle.

8. OTHER CLASSIFICATION CATEGORIES

8.1 Capacity - Design Maximum

Number of riders (design maximum, operator included):

- One (1)
- Two (2)
- Three* (3)

* A conventional two-wheel motorcycle equipped with a sidecar may have the capability of transporting three persons.

8.2 Motive Type

8.2.1 Internal Combustion Engine

- Gasoline (G)
- Alternative Fuel (Alt)

8.2.2 Compression Ignition Engine

- Diesel (D)

8.2.3 Electric

- Battery Electric (BE)
- Fuel Cell (FCE)