

INFO BRIEF

The basics of micromobility and related motorized devices for personal transport



Pedestrian and Bicycle
Information Center
www.pedbikeinfo.org

Introduction

With a surge of new personal transportation devices coming to market, some integrated into shared ride systems (such as bikeshare programs), there is a need to establish a common vocabulary for these options, and provide basic information about how these devices are classified and regulated. This info brief provides an overview of powered forms of micromobility and compares features of micromobility with a spectrum of other traditional and emerging forms of transportation. It references and builds upon micromobility definitions created by the Society of Automotive Engineers (SAE), a standards-developing organization and professional association.

Powered micromobility devices, sometimes called personal e-mobility devices, share three common characteristics:

- **Motorized:** They can either be fully motorized (capable of movement without human power) or motor-assisted, in which the rider provides some human-powered propulsion (such as by pedaling or kicking). They usually involve a battery-powered electric motor but may also be capable of using another energy source, such as gasoline.
- **Low speed:** Most micromobility devices are designed to travel at or below 20 miles per hour (MPH), and some devices may operate at or be regulated to even lower speeds, such as 8 MPH or less, to be compatible with sidewalk use. According to SAE definitions, the top travel speed for micromobility devices is 30 MPH or less.
- **Small size:** The weight, width, height, and length of a device all contribute to defining size. For most micromobility devices, a standard width is three feet or less, fitting within the standard bike lane or sidewalk width, and the weight is typically less than 100 pounds. By SAE's definition, all micromobility devices weigh less than 500 pounds and fall within one of four

weight categories. Cities or other jurisdictions can define the weight and width limitations for different types of roadway facilities.

This info brief specifically focuses on micromobility devices used for personal transportation on paved roads, sidewalks, and paths, and does not cover devices used for vocational purposes and commercial goods/services delivery or for off-road or air-based travel. While pedestrians and bicyclists—including those using nonmotorized bikeshare bikes—might share similar characteristics (such as small size and low travel speed) as well as use the same facilities where micromobility devices are operated, they are already well-defined by most regulatory, roadway design, and injury reporting frameworks and are therefore not included in this info brief. Similarly, motorized wheelchairs and personal mobility devices used by people with disabilities already have a standard legal definition and injury reporting mechanism and are therefore not considered "micromobility," though they are shown in Table 2 as a related device.

Related Terms

Dockless

Dockless devices are those that do not require a parking station in order to pick up or return the device.

Shared-use

Shared-use devices are those that are part of a rental system, rather than personally owned.

Electric-assist

This term is often used interchangeably with the terms "power assist," "pedal assist" or "pedelec" to indicate that an electric powered motor is providing power to supplement human propulsion of a device; it can also be used to define throttle-assisted devices (such as Class 2 e-bikes). See Table 1 for more detail.

Categories of Micromobility Devices

The following table provides examples and key characteristics of common micromobility devices.

Table 1: Common micromobility devices

Device	Electric standing or sitting scooters (e scooters)	Electric bicycles (e-bikes)			Other ¹
		Class 1 Pedal assist (pedalec)	Class 2 Throttle assist	Class 3 Pedal assist (pedalec) at higher speed	
Example brands	<p>Shared: Bird, Lime, and many others</p> <p>Owned: Inboard Glider, Segway 9Bot</p>	<p>Shared: Lime, Mobike, Ofo, Pace, Spin, and many others</p> <p>Owned: Most major bike brands; multiple passenger versions include Organic Transit (ELF) and Yuba</p>	<p>Owned: Several bike brands (less common than Class 1 and 3)</p>	<p>Owned: Several major brands; multiple passenger versions include Better Bike (PEBL), and Podride</p>	<p>Owned: Boosted, Inboard, Mellow Boards, Metroboard</p>
Weight	Typically < 50 lbs	Typically < 100 lbs; multiple passenger versions near 200 lbs	Typically < 100 lbs	Typically < 100 lbs; multiple passenger versions near 200 lbs	< 50 lbs
Occupants	Single rider	Usually a single rider; some cargo e-bikes or bike cars designed for multiple riders	Typically designed for single riders	Usually a single rider; some designed for multiple riders	Single rider
Power supply	Electric motor typically < 750 watts	Electric motor typically < 750 watts	Electric motor typically < 750 watts	Electric motor typically < 750 watts	Electric motor typically < 750 watts
Product speed ²	20 MPH or less; some cities apply additional speed restrictions	20 MPH or less	20 MPH or less	28 MPH or less	Most are 20 MPH or less though some can go up to 30 MPH
Operating space	Varies by place; ³ some cities restrict in crowded places	Varies by place; ³ usually allowed on bike transportation facilities and paths	Varies by place; ³ usually allowed on bike transportation facilities and paths	Varies by place; ³ some States restrict access on bike paths	Varies by place ³
Regulated by	Consumer Product Safety Commission (CPSC), for personally owned devices ⁴	CPSC (only for personally owned devices)	CPSC (only for personally owned devices)	CPSC (only for personally owned devices)	CPSC (only for personally owned devices)

Other Related Transportation Modes

Table 2 shows other forms of travel that may share similar features or operating space with micromobility but do not technically meet the definition of micromobility and may be subject to different regulatory standards.

Table 2: Devices that may be related to, but outside of, the micromobility classification.

Device	Mobility scooter	Golf cart	Moped / Scooter, < 50 cc ⁵	Motorcycle / Scooter, > 50 cc
				
Example brands	Drive, Pride Medical, Rascal	Polaris, Yamaha	Tomos, Vespa	Harley, Honda, Yamaha
Weight	200-400 lbs	500-1100 lbs	200-250 lbs	250-500 lbs
Occupants	Single rider	Multiple riders	1-2 riders	1-2 riders
Power supply	Battery powered motor	36 or 48-volt batteries or gas powered (2 or 4 stroke engine)	Electric or gas (50cc or less) producing under 2 HP; may require pedal start	Electric or gas powered
Product speed?	4-12 MPH	20 MPH or less	30 MPH or less	Regulated by posted speed limit only
Operating space	Sidewalks and trails; allowed on recreational trails for nonmotorized use for people who have mobility impairments	Golf courses, and in-street and on trails in some communities; usually not allowed on recreational trails for nonmotorized use	In-street only; usually not allowed on recreational trails for nonmotorized use	In-street only; usually not allowed on recreational trails for nonmotorized use
Regulated by	Food and Drug Administration (as a medical device) and the Americans with Disabilities Act (ADA)	CPSC (considered sports equipment)	DMV; some require license, registration, or insurance	DMV; most require license, registration, and insurance

Additional Resources

PBIC Micromobility Resource Collection contains a curated and regularly updated set of links to key research, resources, case studies, policy briefs, and webinars on the topic of micromobility.

Powered Micromobility Committee of the SAE, Standard J3194, A Taxonomy and Classification of Powered Micromobility Vehicles, provides a set of definitions and a classification that can be used by regulators to standardize descriptions of micromobility devices (for either shared or personal use).

How and Where Should I Ride This Thing? "Rules of The Road" for Personal Transportation Devices summarizes and evaluates existing personal transportation device regulations across hundreds of jurisdictions and provides recommendations for State-level regulations.

Framework for Considering Motorized Use on Nonmotorized Trails and Pedestrian Walkways provides guidance for permitting e-bikes on nonmotorized paths. Note: this framework does not apply to trails funded under the Recreational Trails Program (RTP). Under the current RTP, any device with a motor, except for a motorized wheelchair, is defined as motorized.

PeopleForBikes shares up-to-date information on Federal and local e-bike policies as well as resources for e-bike retailers and people interested in electric mountain bikes.

State Electric Bicycle Laws - A Legislative Primer offers in-depth discussion of the legal regulations that pertain to e-bikes.

The American Society for Testing and Materials (ASTM) **F2641 - 15 Standard Consumer Safety Specification for Recreational Powered Scooters and Pocket Bikes** and **ASTM F2642 - 15 Standard Consumer Safety Specification for Safety Instructions and Labeling for Recreational Powered** provide voluntary standards for micromobility products, including scooters and pocket bikes. Underwriters Laboratory (UL) often develops "Outline of Investigations" prior to the development of a voluntary standard, which typically serve as the initial draft of any subsequent voluntary standard. Please see the **UL 2272 Standard for Electrical Systems for Personal E-Mobility Devices** and the **UL 2849 Outline of Investigation for Electric Bicycles, Electrically Power Assisted Cycles, Electric Scooters, and Electric Motorcycles**.

Notations

- ¹ This category includes e-skateboards; e-skates; e-boards or other self-balancing devices (sometimes called hoverboards or balance wheels).
- ² Speed intended for usage by manufacturer; this may be regulated by State or local ordinances and may differ from actual operating speeds or modifications made by the device user.
- ³ In some circumstances, paths may have restrictions based on the Federal or State regulations, or the source of funding. These restrictions are often marked at the entrance to the facility, but not always.
- ⁴ CPSC is a regulatory body that identifies if a product is safe to sell in the U.S. under the Consumer Product Safety Act. It does not regulate who can purchase a device or where or when devices can be legally ridden.
- ⁵ Moped/scooter/motorcycle definitions are highly variable by State. For example, in North Carolina, there is no separate category for scooter; "scooters" may be mopeds or motorcycles depending on engine capacity. These devices and motorcycles are often regulated at the Federal level through the Consumer Product Safety Commission, although they are not regulated by the Federal Motor Vehicle Safety Standards (FMVSS). Still, States may define and regulate them at the State level and enforce regulations through the Department of Motor Vehicles (DMV) or other mechanism.

SUGGESTED CITATION: Sandt, L. (October 2019). The basics of micromobility and related motorized devices for personal transport. Pedestrian and Bicycle Information Center: Chapel Hill, NC.

ACKNOWLEDGMENTS: Reviewed by Kristin Blank and Katie Harmon (PBIC); Chris Cherry (University of Tennessee at Knoxville); Darren Buck, Wesley Blount, Christopher Douwes, and Shari Schaftlein (FHWA); and Douglas Lee, Rick McCallion, and Patricia Edwards (CPSC).

DISCLAIMER: This material is based upon work supported by the Federal Highway Administration and the National Highway Traffic Safety Administration under Cooperative Agreement No. DTFH61-16-H-00029. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the Author(s) and do not necessarily reflect the view of the Federal Highway Administration or the National Highway Traffic Safety Administration. The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this document only because they are considered essential to the objective of the document.

Since its inception in 1999, the Pedestrian and Bicycle Information Center's (<http://www.pedbikeinfo.org>) mission has been to improve the quality of life in communities through the increase of safe walking and bicycling as a viable means of transportation and physical activity. The Pedestrian and Bicycle Information Center is maintained by the University of North Carolina Highway Safety Research Center with funding from the U.S. Department of Transportation Federal Highway Administration and the National Highway Traffic Safety Administration.



www.pedbikeinfo.org

730 Martin Luther King Jr. Blvd., Suite 300
Chapel Hill, North Carolina 27599-3430

pbic@pedbikeinfo.org

888-823-3977