



# E-BIKES

## BUYERS & OWNERS GUIDE

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Walk Bike Berkeley - E-Bike 1000 MPG Project

Photo credit:



peopleforbikes

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# Roadmap to this Guide

This Guide is aimed at the new bike buyer who is considering purchase of an e-bike. It provides guidance for purchasing a bike to meet your needs and tips for how to take care of your new bike. It does not assume extensive previous understanding of bicycles.

**What is an e-bike** provides a basic description of what an e-bike can do for you and how it works.

**Find the right type and size of bike.** This section provides an overview of the range of bikes available in the market today with or without electric assist and discusses how to select one that fits your life.

**E-bike components** This section identifies the key components that make an e-bike work and discusses different options that you will see in the market and how to think about which will be best for you.

**Outfitting & protecting your e-bike** This section describes accessories such as lights, helmets, and baskets that the buyer should consider purchasing with their e-bike for safety security and to make the bike most useful for carrying cargo.

**Taking care of your new e-bike** - This section covers key issues to consider once you take your bike home - how to keep your bike safe, get the most life out of your battery and maintain your new bike.

**More Resources** - This provides links to websites with more information about e-bikes.

There are currently three factsheets that are abbreviated versions of portions of this document:

1. [Intro to e-bikes](#) - A brief description and FAQ on e-bikes. Aimed at introducing newcomers to the concept of an e-bike and answering basic questions about how they work. For promotional purposes to get people interested in e-bikes and ready to consider one.
2. [Outfitting & protecting your e-bike](#) - A list of important accessories to purchase with a new bike and reminders about insurance. Designed for use as a shopping checklist to get everything needed to ride safely and protect and maintain the bike.
3. [Taking care of your new e-bike](#) - Owners guide type information on security, battery care, and maintenance.

# What is an e-bike?

An e-bike (electric bike) is a bicycle with a boost. A battery and electric motor take the sweat and effort out of bicycling, making it accessible to people of all ages and physical condition. They can replace a car by making it practical to carry heavy loads, go long distances and climb steep hills. They are extremely energy efficient - equivalent to a car getting over 1,000 MPG- and have only a small fraction of the climate emissions. They are far cheaper to operate than car, using less than a penny a mile of electricity to charge the battery.<sup>1</sup>

Some e-bikes have a **throttle** and operate like a moped or motorcycle without pedaling. Many are **pedal-assist** e-bikes which detect when you press on a pedal and instantly provide power to help.

Most pedal assisted e-bikes allow you to select the level of assist that you want - more to go faster or make climbing up a hill easier, less when you want to get more exercise or to go more miles before needing to recharge the battery. Most e-bikes allow you to pedal the bike without the motor as well. Batteries typically provide enough power to ride anywhere from 20 to 80 miles before requiring a charge. Batteries are charged in 2 to 6 hours by a small home charger that plugs into a normal home electric socket.

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<sup>1</sup> For more information on the energy efficiency and climate effectiveness and operating costs of e-bikes see [E-Bike 1000 MPG Project \(https://sites.google.com/view/ebikestudy\)](https://sites.google.com/view/ebikestudy)

# Find the right type and size of bike

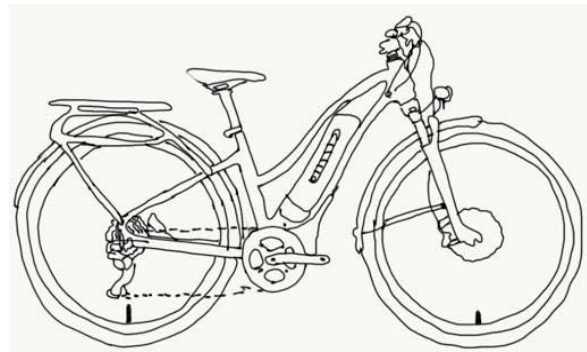
## What type of bike do I need?

E-bikes come in all shapes and sizes. Consider how you will use it and what type of bike will be most comfortable and effective for the kind of riding you want to do. Bikes (electric or solely pedal powered) fall into and between a wide variety of categories and there is an e-bike made in every category.

- **City & casual** - People looking for a bike for commuting or errands or casual recreation will generally use one or more of the following four types:

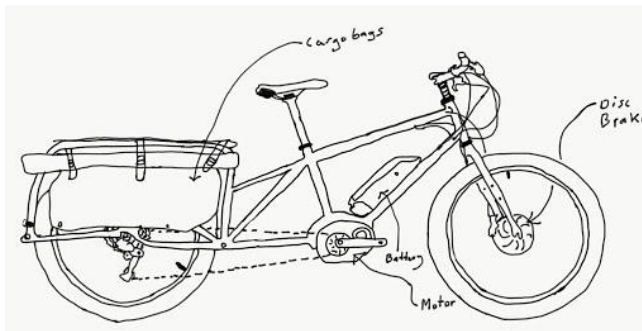
- **Commuter/hybrid** - These are designed for a mixture of riding conditions. They feature flat handlebars, mid-size tires and a somewhat upright seating position. This is the most common type of bike and a good compromise for a variety of conditions and types of riding.

- **Cruisers** - Sometimes called **Dutch bikes**. These bikes are designed for maximum comfort. They have high swept-back handlebars that support the most upright position, They have wider tires than hybrids to cushion bumps and often have **step through** frames which do not require swinging your leg over the back of the bike. This can make it much easier to get on and off. These bikes are great for less flexible people.



- **Cargo bikes** - These bikes are designed primarily for carrying things or

passengers. There are several types: **Longtail** bikes, like the name implies, are much longer than a regular bike and have an extended back section for carrying things in extended pannier bags or passengers straddling the tail.



**Long Johns** or **Bakfiets** put the cargo - or additional riders - in

front of the bike in a large box . Both of these types of cargo bikes have relatively upright positions and are great options for families with young children. They also are used for delivery services.

- **Folding bike** - This is actually a subset of some of the above types, designed to make it easier to take bikes on transit and to store where space is limited. There

are folding versions of commuter bikes and longtail cargo bikes. The wheels and the overall size of the unfolded bike are often smaller than similar non-folding bikes.

- **Sport:**- in recent decades there has been an explosion of bike design tuned to different kinds of terrain and riding styles.

- **Road bike** - These bikes are designed for speed and distance on smooth well paved roads. They sport very skinny smooth tires for minimum rolling friction and



drop handlebars so that the rider leans very far forward for the best aerodynamics. A premium is put on lightweight frames and components for racing. All of these features make for a faster but less forgiving bike that will not handle the potholes and tracks of urban riding well.

- **Mountain bikes** - These bikes are designed for aggressive riding off-road on steep and rough trails. They have very wide, large tread tires, suspension systems, flat handlebars, high bottom brackets (the part that holds the pedals) to clear trail obstacles, and an upright position all for handling the jarring bumps of rough terrain. **Hard tails** only have fork suspension (in the front) while **full suspension** bikes have both front and rear suspension. All of these things make for a bike that is nimble off road, but much harder to pedal on a paved road



- **Adventure bikes/gravel bikes** - These bikes are a newer category for riders tackling a mixture of paved and gravel roads and dirt trails. The dropped handlebars and geometry are similar to road bikes but with a slightly more upright position. They use wider tires with more side tread than a road bike for grip in loose conditions but unlike a mountain bike tire they still have a smoother raised central strip for reduced rolling resistance on paved roads. This supports mixed terrain riding with a happy medium between the road bike's speed and the mountain bike's comfort.
- **Cyclocross** - These bikes are tuned for off road racing. Like road bikes, the frame geometry and dropped handlebars support an aggressive forward leaning riding position and a premium is put on keeping weight down for both speed and to ease of carrying over obstacles, but it still must be burlier than a road bike. Like mountain bikes, they use knobby tries to keep traction in rough, loose terrain, but are narrower than mountain bike tires to reduce rolling resistance.

Like gravel bikes, these bikes can provide more versatility in the types of conditions and comfort in which you can ride than either a road or mountain bike.

- **Specialty**

- **Recumbent** - These are bikes in which the rider lies down with feet forward instead of sitting upright or crouching over with the head forward. The seat is generally more comfortable and supportive than an upright bike and hence good for some that have ergonomic challenges with upright bikes. It also has lower aerodynamic resistance so has been used to break speed records.
- **Tricycle** - Three wheeled versions of both upright and recumbent bikes are a boon when balance is an issue whether because of age, disability or unbalanced or dynamic cargo loads.



image from [www.icetrikes.co](http://www.icetrikes.co)

## Bike sizing

It is very important when buying a bike is to make sure it is the right size. Any good bike shop should be able to help you with this. These four factors are key:

- On a bike with a horizontal top tube you want to be able to stand over it with 1 to 2 inches of clearance.
- When sitting on the saddle your back should be at about a 45 degree angle and your arms should be at about a 90 degree angle to your back unless you are buying a cruiser, trike, or other highly upright position bike.
- Seat height is key to comfort and efficiency. Many people ride with seats set too low which is less efficient and can lead to knee problems. When sitting on the seat with your foot at the bottom of the pedal stroke and bottom of the foot parallel to the ground, your knee should be almost fully extended with just a slight bend. Have someone hold the bike to balance you while you check for this.
- Seat position is also important. With your pedals level with each other, drop a string with a weight at the end from your front knee. The string should fall just in front of your pedal axle. Adjust your seat forward or back to get in the right spot.
- Here is a great short video on [bike fitting](#).

## How do I select the right e-bike?

The options of bike types are dizzying. Discuss the type of riding you expect to be doing with your local bike shop. They may recommend that you try bike types you are not familiar with, but that may better serve your needs than more familiar bikes. Make sure to take **test rides** on a range of different types and sizes of bikes to understand what will work comfortably for you. E-

bikes are generally significantly heavier than pedal-only bikes. Expect anywhere from 30 - 70 pounds. Weight and balance issues should be considered carefully. Try picking up the bike to get it up over a curb or up a short flight of stairs to make sure the weight balance works for you. Your dealer will also provide invaluable advice on **sizing**. Ask your dealer about options for taking a bike for a longer test ride. Some dealers offer **rentals for a full day or more** with the rental price applicable toward a purchase.

## E-bike components

Once you have selected the bike type you want to ride, you will find that e-bikes come in a variety of different setups for the motor and controls.

### Pedal assist vs throttle controls

- **Pedal-assist** (or pedelec) bikes detect when you press on a pedal and instantly provide power to help. They also detect how hard you are pressing and provide a proportional amount of power to what you are producing. The harder you pedal, the harder the motor pushes. This makes it feel very natural. You also can select between 3-5 levels of assistance depending on the model. You can dial up more assistance to make pedaling faster or to make a steep hill climb easier or dial down less assistance when you want to make the battery last longer or want to get more exercise.
- **Throttle** bikes have a twist grip, trigger lever or button that controls the motor without pressing a pedal. They are a good option for those who are less able to pedal. They put more wear on the gears and chain and use more electricity. All throttle e-bikes must have operable pedals. Some throttle bikes have a pedal assist mode in addition to a no-pedal throttle mode.

## The E-bike Class system

The state of California defines e-bikes by using a three-class system, defined largely by the type of electric motor control (pedal assist or throttle) and top assisted speed (20 or 28 mph)<sup>2</sup>. These limits control the maximum speed at which the motor will provide assistance to the rider. They are for safety on lanes and paths that are shared with non-motorized bicycles, and in some cases, with pedestrians. A cyclist may still ride the bike faster under their own pedal power, subject to other local speed limits.

This legislation has been adopted in almost 30 other states and gives e-bike riders consistency with similar rights and duties to that of traditional bike riders on most public roadways, including bike lanes and multi-use paths<sup>3</sup>. In some parks, however, e-bikes may be subject to motorized

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<sup>2</sup> State of California Vehicle Code, Section 312.5

[https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?sectionNum=312.5.&lawCode=VEH](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=312.5.&lawCode=VEH)

<sup>3</sup> People 4 Bikes Policies & Laws webpage <https://peopleforbikes.org/our-work/e-bikes/policies-and-laws/>



vehicle restrictions on non-motorized and natural surface paths and trails, particularly mountain bike trails. Check with your city or park authority as these regulations may vary and be in flux.

Every legal e-bike sold in California is labeled with a sticker that shows the class of the e-bike, its top assisted speed, and its motor wattage.

### **CLASS 1 - PEDAL ASSIST**

- **What it is:** Bicycle equipped with a motor wattage of 750 Watts or less that provides assistance only when the rider is pedaling, and that ceases to provide assistance when the e-bike reaches 20mph.
- **Where you can ride it:** Class 1 e-bikes can be ridden wherever bikes are allowed, including bike lanes and multi-use paths. Check locally for non-motorized, natural surface trails rules.
- **What is required:** Class 1 e-bikes **do not** require a license to operate. They have the same rights and duties as a traditional bike rider.

### **CLASS 2 - THROTTLE ASSIST**

- **What it is:** Bicycle equipped with a throttle-actuated motor with wattage of 750 Watts or less, that ceases to provide assistance when the e-bike reaches 20mph.
- **Where you can ride it:** Class 2 e-bikes can be ridden wherever bikes are allowed, including bike lanes and multi-use paths. Check locally for non-motorized, natural surface trails rules.
- **What is required:** Class 2 e-bikes **do not** require a license to operate. They have the same rights and duties as a traditional bike rider.

### **CLASS 3 - PEDAL ASSIST**

- **What it is:** Bicycle equipped with a motor wattage of 750 Watts or less that provides assistance only when the rider is pedaling, and that ceases to provide assistance when the e-bike reaches 28mph.
- **Where you can ride it:** Class 3 e-bikes can be prohibited on some bike paths. Always check locally before riding. Check locally for non-motorized, natural surface trails rules.
- **What is required:** Class 3 e-bikes do not require a license to operate in some areas. Always check locally before riding.

### **OUT OF CLASS ELECTRIC VEHICLES**

- If an e-bike allows pedal assisted or throttle speeds over 28 MPH it is considered a moped or motorcycle and subject to all motor vehicle rules and generally not allowed on bike paths.



VEHICLE TYPE	VEHICLE		USER				BIKEWAY ACCESS			
	PEDAL OPERATED	MAXIMUM MOTOR-ASSISTED SPEED (MPH)	MINIMUM AGE (YEARS)	DRIVER'S LICENSE	LICENSE PLATE	HELMET	CLASS I BIKE PATH	CLASS II BIKE LANE	CLASS III BIKE ROUTE	CLASS IV PROTECTED LANE
BICYCLE	YES	N/A	N/A	NO	NO	17 AND UNDER	YES	YES	YES	YES
CLASS 1 E-BIKE	YES	20	N/A	NO	NO	17 AND UNDER	YES	YES	YES	YES
CLASS 2 E-BIKE	NO	20	N/A	NO	NO	17 AND UNDER	YES	YES	YES	YES
CLASS 3 E-BIKE	YES	28	16	NO	NO	YES	NO	YES	YES	YES
MOPED	NO	N/A	16	YES	YES	YES	NO	YES	YES	NO

## Batteries & Range

Battery capacity is generally measured in amp hours or watt hours (amp hours times voltage). A standard 24 or 36 Volt 10 amp hour battery pack will go anywhere from 20-40 miles on a charge depending on many factors including speed, weight carried, hills, wind, road surface, tire pressure, bike condition, and how hard the rider pedals and how much assistance is used. Extended range batteries with higher amp hour or watt hour ratings may provide a range of 50-80 miles and beyond on a charge. Charging batteries generally takes 2-6 hours depending on the battery size and how far it was discharged. Charging is done with a small home charger that plugs into a normal home electric socket and normally costs less than a penny a mile in electric costs. Batteries in many models are easily removed to bring to . If the battery is integral and not easily removed by the user, consider how you will get the bike and charger close to an outlet or how you will bring an extension cord to it.

## Motor power

**Watts** are a measure of the power that a motor is rated to provide. Most e-bikes sold for commuter or on road recreation in the US have motors rated between 250 watts and the 750 watt limit for Class I & II e-bikes. How much power you need will depend on how much weight you will be carrying and how much steep hill climbing you will be doing. Motors also have a **voltage** rating. Higher voltage motors generally have more acceleration power. A 24 volt 250 watt motor may be plenty for a solo commuter in flat lands and gentle hills, while a cargo bike expected to carry kids and groceries up steep hills may have a 48 volt motor rated at the maximum allowable 750 watts.

Unfortunately, there is lots of variability in how the watt rating is measured by different manufacturers and in other design variables that affect how much power you will experience. It

is a good idea to test ride a couple of bikes with different power levels to find one that's right for you, particularly if you will be riding in very hilly territory.

## Motor location

E-bikes may have a motor mounted in one of the wheel hubs ("hub drive") or in the middle, usually between the pedals ("mid drive"). Each has advantages and disadvantages.

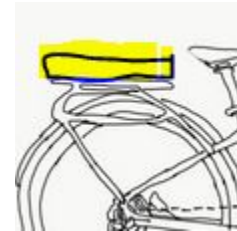
- **Hub drive** - The motor is integrated into either the front or rear wheel hub. Most rear hub systems are pedal assist, but many front hub systems are limited to throttle only. Some manufacturers are starting to develop pedal assist systems for front hub motors.
  - Pros - Hub drives are cheaper than mid drive and generally require less maintenance. Since the motor works directly on the wheel, it does not put any additional strain on the chain and gears of the bike reducing wear on the drivetrain.
  - Cons - The weight of the motor placed in a wheel can make the bike feel oddly balanced and make handling harder while riding and while hauling the bike over a curb or up a stair. Hub motors usually only have a single gear so are not as effective for hill climbing. Removing the wheel is more complicated, making it harder to change tubes and tires.
- **Mid drive** - The motor is in the center of the bike, usually integrated into the pedals.
  - Pros - It uses the bike's gear system so can provide more power for hill climbing and acceleration from a stop. They usually weigh less than hub motors and having the extra e-bike weight in the middle makes it better balanced and easier to lift the bike when needed. Mid drive motors often use sensors that directly measure how hard you are pushing on the pedals to determine how much power to give when doing pedal assist. This makes for a smoother and more responsive ride. Mid drive motors increase stability by having a lower and more central center of gravity.
  - Cons - They put more wear on your drivetrain, though companies are now producing e-bike drivetrains that can handle this better. They often cost more. They are more complex and so require more maintenance and have more parts to fail.

## Battery location

- **Down tube mount:** Many e-bikes put the battery on the down tube - the tube that runs diagonally from the handlebars to the pedals. Some even integrate the battery inside an oversized downtube to hide it. This location puts the weight in the center of the bike and relatively low which generally improves handling. It also simplifies wiring to a mid drive motor. This location may interfere with brackets to carry water bottles or locks.



- **Rack Mount:** Rear rack battery mounting may work better with step through frames or where the downtube space is needed for other mountings. It does, however, put the battery weight higher on the bike which can affect handling on corners. Furthermore, having the battery on a rack is generally less secure than built into the frame. Make sure that the battery rack still allows panniers (paired baskets on the bike's sides) to be clipped to the side of the rack for carrying groceries or other cargo.



## Controller

The controller on an e-bike is a device mounted on the handlebars that controls the level of assistance from the motor. It also serves as the bike's "dashboard," communicating important information including the speed, amount of battery remaining, miles ridden and an estimate of the miles until the battery runs out of power. The level of assistance may be indicated by numbers with higher numbers indicating more assistance or the levels may have names like "Eco" and "Sport." Using different modes allows you to increase range by using a lower power mode, or make the bike feel more sporty and powerful by using a higher power mode.

## Security

E-bike manufacturers are starting to pay more attention to protecting e-bikes from theft. Make sure the battery is securely lockable. You won't want to carry it with you everywhere. Some brands are starting to add security features, such as GPS trackers (e.g., [Faraday](#)), tamper detection and remote lockdown modes and retrieval services (e.g. [VanMoof](#)). GPS trackers are also available as aftermarket addons.

## Outfitting & protecting your e-bike

### Accessories - what you need for safety, security, & function

When you buy a car, many extra items are included that are important for your safety (like lights and seat belts), security (like locks and keys), functionality (trunk for carrying things), and repairs (spare tire, jack and wrench). When you purchase a bicycle many of these kinds of items may not be included and must be purchased separately. Every cyclist should consider purchasing each of the items listed below.

- **Visibility** - The following are recommended items to keep insure you visible and secure on the road
  - **Helmet** - Get one for each rider in the household. MIPS (Multi-directional Impact Protection System) style is recommended.

- **Bright yellow jacket or vest** - Bicycles can be very invisible to drivers, and bright clothing can make a big difference to being seen at twilight and at night. You should have one jacket or vest for each rider in the household.
- **Lights** - Some e-bikes come with lights included as a standard item, but most do not. Bike manufacturers are required to install reflectors on all bikes, but these are not sufficient to protect you from being hit by a car at night. Lights are the responsibility of the rider, not the manufacturer, but required by law in many states (including California<sup>4</sup>). A bike must have one white light in the front to ride at night and a red light in the rear is recommended. Blinking lights are excellent for high visibility in urban settings and have much longer battery life than steady lights, but battery life is less of an issue in an e-bike than a regular bike..
- **Bell** - This is very useful for warning pedestrians as you approach. If you will be riding in traffic a lot, you may want to consider a horn.
- **Pant clips** - needed to keep pants from getting caught in the chain if there is not a chain guard.
- **Security** is critical. E-bikes and their parts will be attractive to thieves. Get a tough lock and learn how to use it well to lock at least both wheels and your helmet. Lock it securely at home and work, not just when you are out in the world.
  - **Lock** - You get what you pay for. Get the highest quality lock you can afford. Heavy duty, keyed U bolt or chain is best. Combination locks and cable locks are easily broken and should be avoided. Look for locks rated “Sold Secure Gold” or “ART 3 stars” or better.
  - **Wheel & seat security** - These are common targets for theft. Quick release axles make fixing a flat tire or removing the tire to fit in a car quick, but also make theft quick (see Security section below). Likewise, quick release seatposts make adjustments easy if multiple riders of different sizes are sharing the same bike, but otherwise just make the seat an attractive target for theft. Bolts are safer than quick release. Lockable options include:
    - **Cables:** These are used to thread through the wheels and then locked with the main lock (See below under “Taking care of your new e-bike”). A cable can also be used to lock the helmet to the bike. A small cable & lock can secure the seat.
    - **Security skewers:** lockable axles for your wheels or seatpost.
    - **Pin lock bolts:** These bolts require a special tool to remove and make it very difficult for a thief to steal the seat, wheels or other parts.
  - **GPS Tracker** - A device that mounts to your bike, detects when someone else moves it, sends an alert and tracking to your cell phone.

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<sup>4</sup> California requires “a front lamp emitting a white light visible from a distance of 300 feet” (and) “a rear red reflector or a solid or flashing red light with a built-in reflector visible from a distance of 500 feet” as well as various reflectors on both wheels, plus pedals, shoes or ankles or California Vehicle Code CVC §21201 - Division 11, Chapter 1, Article 4  
[https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?lawCode=VEH&sectionNum=21201](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=VEH&sectionNum=21201)

- **Carrying capacity.** Think about how you will be haul things (or people!) to make your bike a true replacement for a car. Of course, you can always start with a backpack or messenger bag until you can afford add-ons for your bike.
  - **Cargo Rack** - If the bike is not a cargo bike with built in carrying options, a bike should have at minimum one good rear rack that can carry panniers.
  - **Child Seating:** Some cargo bikes come standard with seating, but more often at least padding will be an add-on item. For younger kids, you also may need a full child seat or “monkey bars” or a similar rail system to surround kids on the rear of longtail bikes and give them something to hang on to.
  - **Panniers** - These are baskets or bags that hang on either side of a rear rack. They may be either open baskets or a set of strap-on bags. They should be large enough to hold at least one full grocery bag. Some are foldable. Some are removable so you can carry them with a shoulder strap or even as a backpack. If you are planning to ride year-round including **in the rain**, consider (more expensive) **waterproof panniers**. Also consider **fenders**.
  - **Front basket**
- **Tools.** If you live far from a bike shop or just like doing your own minor maintenance at home, you might want to consider tools for maintaining tire pressure, fixing flats and tightening bolts and keeping your chain running easily.
  - **Pump & Pressure Gauge:** Your tires will lose pressure over time and need to be pumped up about once a month. There are two types of valve Schrader (the kind used on automobile tires) and Presta (thinner valve used on some high pressure bike tires). Most pumps have an adapter for either valve type. A tire pressure gauge is useful to insure inflating your tire into the recommended pressure range, although some people are satisfied with checking by thumb pressure. Some pumps come with a gauge built in. Beware - the gauges on some less expensive models can be inaccurate - some over 10 pounds off.
  - **Patch kit &/or a spare tube:** Broken glass happens.
  - **Tire irons/levers:** These are needed to remove the tire to change a flat tire
  - **Wrench and/or hex key set:** If the bike does not have quick release axles and seat post, this will be necessary to remove wheels to repair a flat tire or to adjust the seat height. This also will be useful for tightening other bolts that may come loose over time.
  - **Chain lubricant:** Your chain will last longer and riding will be much easier if you oil your chain every few weeks or after it is exposed to lots of rain or dust.
  - **Chain wear gauge:** This helps you determine when your chain is too worn and should be replaced.
- **Rain protection** - If you intend to ride year-round you will want some protection for you and your gear from rain.
  - **Fenders** - Front and rear. Bolt on instead of clip on will be more secure and harder to steal
  - **Waterproof pannier bags** - These are more expensive than non-waterproof ones but can make a big difference if you are going to ride through rainy weather.

## Dealer repairs

**Warranty:** Ask your dealer about what is covered under their warranty.

**Maintenance plans:** For repairs beyond the initial warranty, find out if your dealer offers a prepaid maintenance plan. Some dealers offer special deals in these with the purchase of a bike. See more below under *Taking Care of your New e-bike*.

## Bike insurance

Homeowners and renters insurance generally cover theft from your home (or sometimes your car). Check with your insurer to confirm that you are covered for loss outside of your home and to understand your deductibles. Listing the bike with the insurance company can help improve coverage. Consult with your insurance company to learn if it will raise your rates. Insurance is available specifically to cover a bicycle from Velosurance<sup>5</sup> and Markel<sup>6</sup> but it is not cheap. There is an excellent discussion about bike insurance on the Best Bike Lock website.<sup>7</sup>

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<sup>5</sup> Velosurance bike insurance website <https://velosurance.com> In July of 2020, we received an online quote from Velosurance of \$155/year (or \$23.25/month) for a \$2,500 e-bike in California with a \$200 deductible. \$300 and \$5000 deductibles were also available for lower rates. Liability, medical and uninsured motorist coverage were also available for higher rates.

<sup>6</sup> Markel bicycle insurance website <https://www.markelinsurance.com/bicycle>

<sup>7</sup> Best Bike Insurance (Do we even need it?), The Best Bike Lock, <http://thebestbikelock.com/best-bicycle-insurance/>

# Taking care of your new e-bike

## Security - ward off the thieves

If you take precautions to keep your bike secure and give it regular maintenance, it should last you many years. Theft of bikes is rampant but with careful attention to how you store your bike at home and how you lock it out in the world you can dramatically reduce the chances of loss.

**Register your bike:** Take a picture of your bike and file it with the serial number, pictures and description (make, model, color and any other distinguishing characteristics) with both of the free non profit national bike registries: Bike Index<sup>8</sup> and 529 Garage<sup>9</sup>. These allow you to alert police and other riders inside and outside of your local community to watch for your bike if it is stolen. In some communities, city or county police may also offer a bicycle registration program. Use them all.

**Always use a high quality, heavy duty, keyed U-lock.** Cable locks and combination locks are easily broken by thieves. Don't worry about weight. Your e-bike will help you push that heavier lock. Consider using a second lock. No lock is unbreakable, but the more work you put the thief through, the more likely they will move on to another bike.

**At home:** Don't trust a garage, porch, or backyard, even with a locked gate. **Always lock the bike** to a thick, secure, solid metal post or part of a building. Thieves have been known to cut trees, wooden railings, and chain link fences to steal bikes. Bring it inside if at all possible. Always lock the frame, inside of one of the triangles. Never, ever, just lock a wheel, even at home.

**Out in the world:** Always **use bike racks** where available. Lacking that, look for street signs, parking meters or other solid metal poles that are securely in the ground and that a bike and lock can't be lifted up off. Lock your bicycle in a **well-lit, publicly visible**, well-traveled area, such as in front of a bustling cafe or other active business. Don't give thieves a place to work out of sight. Avoid leaving your bike outside overnight. Use secure parking, such as BikeLink, where available,<sup>10</sup> and use your lock,

**Secure to something tough:** The lock around a bike rack or thick metal or concrete post or railing. Avoid thin tree trunks or limbs, chain link fences and wooden posts. If you use a signpost, make sure the post you lock to actually has a sign or meter bolted on top of it that will keep the thief from just sliding the lock up off the post. Give it a tug to make sure it is actually

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<sup>8</sup> Bike Index website <https://bikeindex.org/>

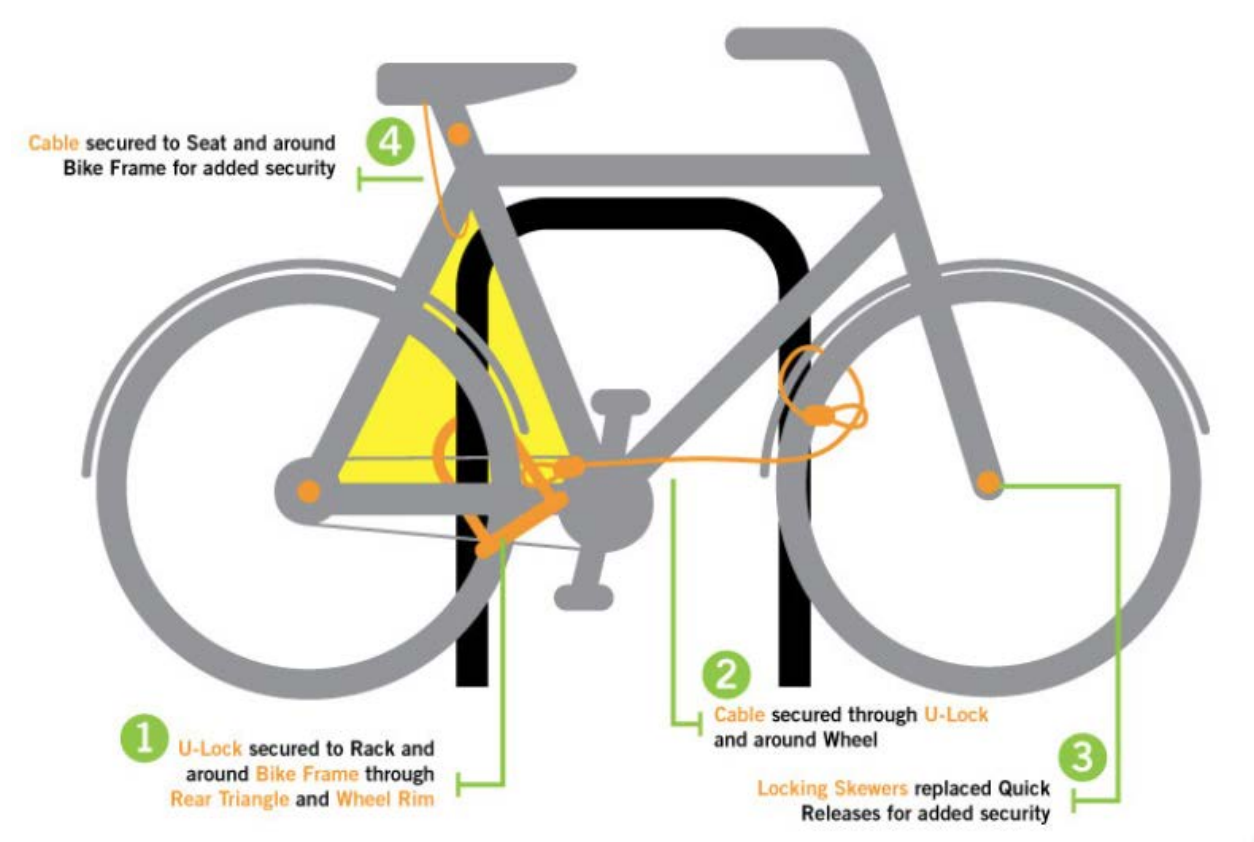
<sup>9</sup> 529 Garage website <https://project529.com/garage> Project 529 apparently scrapes data from Bike Index, so registering on Bike Index may be sufficient but you may want to register with both to take full advantage of each one's services in the event of theft.

<sup>10</sup> BikeLink is a system of bike storage that includes individual lockers, rooms, and valet parking. <https://www.bikelink.org/map>



secured into the ground as thieves sometimes leave dummy posts or leave posts cut in hidden ways.

**Lock the frame:** Thieves love bikes with only a wheel locked. Find a bike with an unlocked wheel, then find a bike with a lock around a wheel. It takes only a minute to take them apart, put the wheel on the frame and ride off. Put your lock around a leg of one of the triangles in the frame. Alternately you can lock the rim of the rear wheel *inside* the rear triangle.



Graphic courtesy of the San Francisco Bicycle Coalition

**Make it hard to break the lock:** Fill the inside of the U of the lock with as much bicycle and post as possible. Try not to give thieves room to insert a jack. And position the locking mechanism to be as inaccessible as possible since this is the weak link thieves will try to work on first.

**Lock the wheels:** Locking skewers in the wheel axle secure the wheel to the frame. If you don't have locking axles, use a cable to lock the wheels. Thread the cable through both wheels and secure it with the lock. Loop the lock through both cable ends. Alternatively to get more usable length from your cable, loop the cable around one wheel and a frame triangle and then thread one end of the cable through the other, loop through the other wheel and attach to the lock (as in the diagram above).

**Secure your helmet & battery:** You may be able to loop the cable through your helmet as well. If your battery has a handle, loop the cable through that too. If it has a key lock, take the key with you.

**Take easily removable accessories:** Remove any clip lights and take them with you along with anything else easily removable, like a water bottle, pump or other tools. Lock your helmet with the cable or take it with you.

**Get creative - go ugly:** A dab of paint, some scraping, some duct tape can suddenly make your bike less attractive to a thief than other shiny new ones.

**Consider a GPS Tracker:** You arm the device with your cell phone when you leave it. A motion sensor detects if your bike is disturbed, sends an alert to your cell phone and tracks the bikes movements. The Sherlock<sup>11</sup> hides the device in the handlebars. The Boomerang CycloTrac<sup>12</sup> mounts with tamperproof screws and includes an alarm.

More hints on bike security can be found at <https://bikeeastbay.org/theft> and <https://sfbike.org/resources/theft-locking> .

## Battery care - get the most life out of your battery

**Charging time:** Most e-bikes are not delivered to you fully charged. You should do an initial charge before extensive riding, which may require leaving the battery plugged in overnight, possibly as long as 12 hours. Thereafter, charging may take anywhere from two to six hours, depending on the size of battery, how far you have drained it and power of the charger.

**Factors that reduce battery capacity:** Batteries lose capacity over time, providing shorter range as they age. Typically, a battery may have about two thirds of the range after 500 charging cycles than it had when new. Manufacturers generally suggest replacement somewhere after 500 to 1000 charging cycles. There is some aging process that happens inevitably over time that is unavoidable. There are additional factors in battery life, however, over which you have some control:

- **Topping Off:** The end of the charge cycle is the hardest on the battery.
- **Heat & Cold:** Very high and very cold temperatures (105°F/40°C+ or below freezing) decrease capacity, especially during charging.
- **Storage:** Leaving the battery at high voltage - meaning fully charged for long periods of time decreases capacity.
- **Draining:** Running a battery all the way to zero is hard on it as well. Most controllers will cut off power to the motor to protect it when it reaches about 20%, well before damage happens.

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<sup>11</sup> Sherlock website <https://www.sherlock.bike>

<sup>12</sup> Boomerang website <https://boomerangbike.com> and EBR review <https://electricbikereview.com/accessories/boomerang-bike/cyclotrac-gps-bike-security-alarm-tracker/>

**How to increase battery life:** To get more range out of your bike and to make it last as long as possible, try to follow these steps:

- **Don't do small top offs daily:** If your daily riding only uses a third or less of the battery capacity, don't top off the charge every day. Wait to charge the battery until the battery level indicator shows half discharged or below - unless, of course, you need to top it off to insure you have enough range for a long ride the next day.
- **Avoid storing and charging in extreme heat & cold:** Try not to leave the bike in a hot place (like a car trunk on a sunny summer day) for an extended period of time. Charge the battery at room temperature when possible. When coming back from a hard ride with high assistance, the battery may be hot. Let it cool off before charging.
- **Don't leave the battery plugged into the charger for multiple days:** If you are not riding for a few days or more, unplug the battery from the charger after the charge is complete. Otherwise, as the battery slowly self-discharges down to 95%, the charger will top it off again, making for multiple small top off charges which decrease battery life.
- **Store partially charged:** If you will not be riding for a week or more, don't leave your battery fully charged - or fully discharged. Charge about halfway (somewhere between 50% & 80%) and stop. Top it off when you are ready to ride again.

And don't stress about when you can't follow these guidelines. It won't kill your battery. Enjoy your bike!

**Should I unplug my charger when not in use?** Some modern chargers, like the Bosch, are good at shutting off their demand for power when they do not sense a battery connected to them. Others, however, continue to use electricity even when not charging. Over the course of a year, these "phantom loads" can add up to more electricity than you use to actually charge your bike battery. Unplug your charger unless you know it to be one that does not draw electricity when not charging. Some people set a timer to help them remember to unplug the charger

## Preventative maintenance - keep it running

**Initial break in tune up:** During the first couple of months, new cables will stretch and some bolts may come loose. It is a good idea to do a thorough inspection of the bike a couple of months after purchasing a bike to tighten bolts and adjust shifter and brake cables. Many bike shops offer this initial tune up service for free.

**Shift gently:** Slow down your pedaling briefly when shifting gears. This reduces strain on the chain and gears and helps them last longer.

**Protect your bike from the elements** when you are not riding. Rain rusts your chain and other components.

**Clean your bike** regularly, particularly after rain. Just like cleaning a car, cleaning a bike prolongs both its appearance and smooth efficient operation. Cleaning the drivetrain (the chain,

gears and derailleur) with a degreaser and rag and reapplying lubricant is also a good idea as chain lube collects dirt that can wear down the drive train.

**Preventative maintenance:** Like a car, a bicycle will need occasional maintenance over time to stay in good working order.

- **Monthly**

- **Keep the tires properly inflated:** If you only learn how to do one type of maintenance on your bike, make it pumping up your tires.<sup>13</sup> Bike tires lose air over time - as much as a couple of PSI (pounds per square inch) per week and usually should be topped off once a month. Keeping your tires properly inflated will make your bike easier to ride and protect you from “pinch flats” where the tube gets pinched when you hit a pothole or other sharp object in the road. Tires list either a maximum pressure or more commonly a suggested range.
- **Twice a year** - As with a car, some parts of a bike regularly wear out and need to be replaced. The frequency with which you need to check them will vary depending on how much and how hard you ride. Start with at least a twice a year check in and adjust as you learn how fast parts on your bike wear out. Whether you rely on a bike shop or do your own maintenance, start by watching these four indicators of bike health:
  - **Keep an eye on the tire tread:** Your tires should last you through several years of typical riding. But once the tread gets worn down near the tire or you see significant cracking, you are at much greater risk of getting a flat tire - and you will lose braking and cornering control.
  - **Watch for chain wear:** Use a chain wear tool or ask the bike shop to check your chain length at least every six months. While chains seem incredibly strong, they do stretch over time and may only last 1000 to 2000 miles. Chain life will depend on how hard you ride, how you shift, how much you ride in dusty, muddy or sandy conditions, and how well you keep your chain clean and oiled. A worn, stretched chain will wear out your gears and lead to skipping and may break. Chains are relatively inexpensive and replacing them regularly helps the more expensive gears last far longer and will reduce the possibility of a chain breaking during a ride. You can also extend the life of your chain by backing off on pedal pressure before you shift gears
  - **Inspect the brake pads:** As in cars, bike brake pads wear out over time. They will wear out fastest when you ride with big loads and/or are doing lots of braking on steep hills. Caliper brakes are usually highly visible and easy to inspect, but the more powerful disk brakes that are more common on e-bikes have a smaller pad that is a bit tougher to find and measure. Learn from your dealer how to inspect them or have the dealer take a look when you have them check your chain. Like the chain, replacing them before they wear out too far will save you from far more expensive repairs to the rest of the brake system. Don't wait until you hear noise coming from your brakes.

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<sup>13</sup> See Bicycling.com's "The Definitive Guide to Pumping Your Bike Tires" By Molly Hurford. Sep 18, 2018 <https://www.bicycling.com/repair/a20038470/the-definitive-guide-to-pumping-your-tires/>

- **Listen for bearing wear:** Over time, the bearings in your bottom bracket and pedal will wear out and not function smoothly. If you hear grinding or a clicking sound when turning the pedals or it does not feel smooth, it is time to take your bike into a shop and to have the bearings inspected and have any worn or cracked bearings replaced.

**Other repairs:** Typical problems include flat tires, brake and gear cables and shifters and wheel spokes that get out of alignment or break. Consider whether you want to learn to take care of your own bike repairs or want to have your bike shop take care of things that go wrong with your bike.

**Do it yourself:** If you are handy with tools, you might want to tackle some or all of these problems yourselves. Some bike shops offer classes in bike maintenance and there are many articles and videos online to help you learn. [Bicycling Magazine](#), [REI](#), [How Stuff Works](#), [Park Tools](#) and a million other YouTube videos provide the basics for do-it-yourself maintenance. Some bike shops also provide classes on different aspects of how to maintain your bike. At minimum, you should learn how to add air to your tires and oil your chain.

**Bike shop maintenance plans:** For more complex repairs, your bike shop should be able to handle any repair your bike will need. If you want to ensure that your bike stays in the best shape, you may want to consider your bike shop's maintenance plan.

Any good bike shop should offer bike buyers an initial tuneup for free. The buyer brings the bike back to the shop after a few months of riding. The shop will check the cables and controls and readjust as the cables stretch and parts break in. They also may help you with further adjustments to the seat and handlebars if it doesn't feel right to you.

Beyond the initial tuneup, longer term bike maintenance plans vary greatly from shop to shop. Some are extremely comprehensive and are included with buying a bike while others cost a lot. Some bike shop plans, like the [Mike's Bikes](#) 5 year plans, cover labor only (no parts) for ongoing tuneups. For a higher price, they include one annual overhaul in which they take all of the moving parts of the bike apart to clean, relubricate and replace any worn parts. A more comprehensive option is [Velocare](#) which some bike shops partner with to cover both parts and labor for either 3 or 5 years.

## More resources

[E-Bike 1000 MPG Project](#) - information on the energy efficiency of e-bikes and their effectiveness at fighting climate change.

[E-Bike 1000 MPG Project - Resources](#) - links to websites with e-bike reviews and articles and videos on buying and owning an e-bike.

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