

## Lighting

**The law says that** if you ride a bicycle on a UK public road between dusk and dawn you must use a white front light and a red rear light. You must also have a red rear reflector and amber pedal reflectors.

The lights must be marked as conforming to BS6102/3 or an equivalent EC standard. That's assuming they emit (or can emit) a steady light, which most lights do. Lights that can only flash are now allowed if they're sufficiently bright ('four candela'), despite the fact that flashing lights are not yet covered by BS6102/3...

The regulations are a bit of a mess as it stands. A rechargeable set-up that lights up the night with 80 Watts of brilliance? Illegal. A dynamo lighting set that goes out completely when you stop? Legal. That little blinky LED? Might be legal, might not.

The good news is that the police sensibly turn a blind eye: if you've got reasonable lights and they're the right colour, then they're content. The bad news is that a lawyer might take a different view. If you were in an accident at night and were using 'unapproved' lights, the lawyer could try to make a case for contributory negligence.

You can legally use unapproved lights in addition to approved ones. You just need one front and one rear light that is legal.

### **Disposable battery lights**

In Britain, disposable-battery lights with filament bulbs are still a popular form of illumination. They're okay if you're riding across town occasionally. If you're riding often you'll exhaust a set of alkaline batteries every week. Few such lights have burn times longer than 10 hours, even on alkalines; most are lower. So while initial purchase prices are low, running costs are high.

It's possible to substitute rechargeable batteries, even though these usually have a lower voltage (1.2V versus 1.5V).

LEDs are replacing filament bulbs in all areas of cycle lighting. Burn times are much longer and so is the bulb life. While LEDs do red light best – to the extent that there's little reason to use anything else for your rear light, whether it's dynamo or battery powered – white LEDs have lately become much better. They're not as good as red rear lights, because the light has to be filtered through a phosphor coating to turn it white, which means that more power is required for an equivalent brightness. Yet compared to filament bulb lamps, they're still super efficient lights.

Some are even BS-approved, such as Cateye's EL300/AU100BS lighting set (which costs £45).

You can substitute rechargeable batteries in LED lights, although the under-volting of these more efficient lights can cause a slight dimming. Red rear LED lights consume so little power and last so long – up to 100 hours or more on a set of alkaline batteries – that using rechargeables isn't such an economic or environmental necessity. Nevertheless, it's better to use larger batteries for longer burn times – that is, lamps that use AA size batteries rather than AAA.

### **Dynamo lights**

Dynamo lights are the norm in European countries where utility cycling is popular, such as Germany and Holland. They provide fit-and-forget lighting that's always available and won't run down at the

cost of a little drag. It really is a little, too – considerably less than 1mph off your speed with a bottle dynamo, and way below 0.5mph with a more efficient hub dynamo.

Almost all dynamos are 6 Volt systems, powering a 2.4 Watt front lamp and 0.6 Watt rear. If you run a battery-powered rear light (LED, of course) then you can fit a 3 Watt bulb up front for extra brightness. Lacking raw power, a lot of work has gone into making dynamo lamps make the best use of the power they have, and even a 2.4W front lamp will provide enough light for unlit lanes.

‘Bottle’ dynamos that run off the sidewall of the tyre are the cheapest and most common. They work better if the tyre has a file-pattern dynamo track on the sidewall. Some slip badly in the rain, which means you lose power – and light! – while the better ones (Axa, Lightspin, Busch und Müller, Nordlicht) cope with most conditions short of snow, sleet and mud. Expect to pay from £15 for the lamp(s) and twice that for the dynamo.

Hub dynamos, which do the power-generation inside a dedicated hub, outperform sidewall dynamos. The drag is much lower and they don’t slip. The disadvantages are that they’re more expensive and they have to be built into a wheel. Expect to pay from about £60 for a wheel using Shimano’s most basic Nexus hub dynamo) or from around £160 for a wheel built using the most efficient, best dynamo there is – the Schmidt 28 Dynohub.

Better dynamo lamps incorporate a stand-light, which comes on when you stop. This is a secondary LED in the lamp, or just the main LED if it’s an LED lamp. Batteries aren’t needed: the dynamo charges a capacitor, which powers the LED. It’s not bright enough to see by, but it’s enough to be seen by.

There’s an interesting new generator lighting system from Danish company Reelight that works by magnetic induction. The LED lamps mount to the wheel axles and you fit magnets to the spokes. As the wheels revolve, the magnets pass the sensors in the lamps and the tiny pulse of energy this produces is enough to light them. They’re ideal for town use, being legal and long-lasting.

### ***Rechargeable lights***

Rechargeable ‘system’ lights with high-quality battery packs offer awesome, car-headlight style illumination – for a price (£100-plus). The more tightly defined your riding pattern on a particular bike (e.g. a regular commute or a twice-weekly ride), and the faster you wish to ride, the more you can make a case for a rechargeable system over a dynamo set-up. And if you want to go off-road at all, it’s a no brainer: get a rechargeable system. As a rule of thumb, you need at least 10W of lighting off-road.

Cheaper systems use basic lamps and sealed lead acid batteries, like car batteries. These are heavy for the power output, but otherwise okay. The brightest lights use Lithium-ion (Li-ion) batteries and High Intensity Discharge (HID) lamps, which you’ll know better as arc lamps. Nickel-metal-hydride (NiMH) batteries still offer good performance, and halogen bulbs are still effective, particularly when a tightly focused spotlight is combined with a wider-angled floodlight. Both types could soon be history: the future, as with all cycle lighting, belongs to LEDs.

The batteries the lamps require fit in the bike’s bottle cage or are strapped to the frame. Burn times, even with large batteries, aren’t great because of the power that high-wattage lamps draw. Two to four hours is about average, which is fine for an evening’s mountain biking. LED lamps draw less power and result in smaller batteries and longer burn times.

You can expect to recharge the battery up to 500 times before it dies, probably less. It helps to use a smart charger, which stops pumping power into the battery and cooking it when it's full. If you do use a normal, slow charger, use a wall-socket timer.

### ***Bike light security***

Lots of battery and rechargeable lights clip on and off easily, with just a small screw-on bracket staying on the bike. This is handy for switching one set of lights between bikes (especially if you buy extra brackets). It also neatly avoids the problem of theft. The downside is that you have to fuss with your bike for a few moments before and after riding and then carry the lamps around – with the risk that they will switch themselves on in the bottom of your bag.

What's more, quick releases can release at the wrong moment: when you hit a pothole your light can be ejected onto the tarmac with a crash. Lights that bolt in place – dynamo lights and rack-fitting lights – stay put. Theft is rare, as it's too much hassle; few thieves carry an 8mm spanner. Vandalism is a risk, however.