

January 2010 Safety Tip
Heavier Bike vs. Stopping Distance
Traction vs. Skidding

There is a belief out there that stopping distance increases as a direct function of increased vehicle weight, is this true?

While it is true that a heavier vehicle requires more **energy** to brake to a stop than a lighter vehicle, that does not mean the heavier vehicle takes **more time or more distance to stop**.

This is how your brakes work:

Regardless of type, disk or drum, your brakes work by pressing a non-revolving material against a revolving material and, as a result, converting (via friction) the energy from the revolving material into heat. The harder they are pressed together, the greater the friction and as a result, the greater the rate of conversion, the quicker you slow down the revolutions of the wheels, and the hotter the brakes become.

Brakes are designed to dissipate the gained heat quickly, thus allowing the brakes to cool to perform adequately the next time you need them. If the brakes heat up too much, the braking material loses its power to brake and may glaze over.

Brakes come in many different sizes- each with the ability to convert a range of energy conversion demands. The bike designers select brakes appropriate for your most demanding requirements. In other words, your brakes are perfectly adequate to totally stop the revolution of your wheels, regardless of how heavy your bike is.

But be aware of the limitations of your brakes, too much weight added to the bike can severely affect the efficiency of the stopping power of your brakes.

Since you know, and all of us have done this, you can lock a wheel while the bike is still moving. You know that the braking energy you apply to your brakes is **NOT WHAT LIMITS HOW FAST YOU CAN STOP!** That limit is also determined by the amount traction of your tires have.

It takes more braking energy to stop (lock) a spinning wheel than it does to slow one down, and because a sliding tire (the result of locking your brakes) has less traction than one that is not sliding, your normally functioning brakes are **NOT WHAT LIMITS YOUR STOPPING DISTANCE!** That limit is also determined by the traction of your tires.

Traction increases with weight.

Adding weight decreases your ability to slide the tire.

Adding weight gives you the ability to stop more quickly

Adding weight increases the energy that must be converted to heat by your brakes in order to slow down.

In effect, adding weight makes it harder to slow, and at the same time it makes it more possible to do so, because of traction!

If you severely overload your bike, so the brakes are no longer powerful enough to cause a skid, then you know that the increase in traction gained by that added weight has finally overcome the ability of your brakes and, thus your brakes then become what limits your stopping ability recorded by time and distance.

Weight affects your ability to stop in TWO WAYS:

- It takes more energy (braking) to slow a heavier weight.
- Traction increases as a result of added weight such that braking can be used without starting a skid.

Thus adding weight essentially CANCELS itself out as an impact on stopping distance, all you need to do is apply your brakes harder in order to fully compensate for added weight.

In general, the heavier the bike, however, the more heat is created by using those brakes and braking power diminishes with higher heat (the glazing effect). Thus on a long mountain side descent, if the time interval between brake usage has not been long enough for the brakes to cool, then you will find that the heavier bike begins to no longer have the braking power of a lighter bike.

THAT is why you use the engine as a brake, by using a lower gear, when going down a long descent.