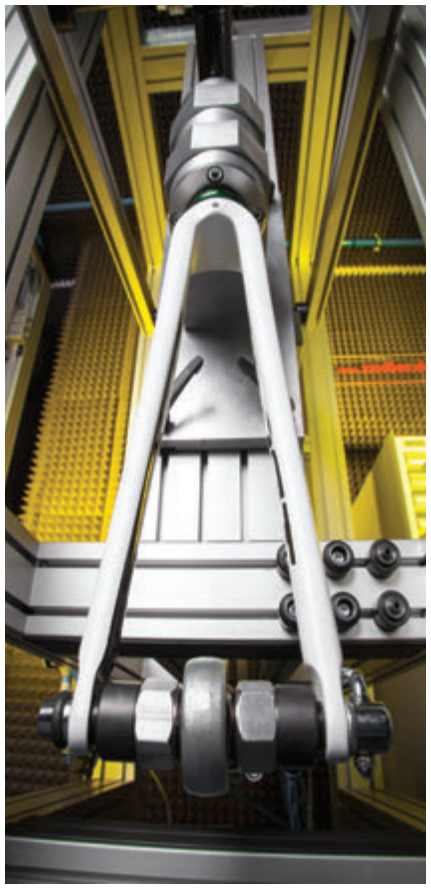
Dirk Zedler

The ISO 4210 standard for bike tests sets a floor, not a ceiling

Since 2015, ISO 4210 has been the established global standard for testing bikes — and that's a good thing for the entire industry. But testing to ISO 4210 alone does not make for a safe bike. Manufacturers should also know that merely complying with ISO 4210 may not absolve them of liability in case of product failures.



Testing a fork at the Zedler Institute

Here is the background on ISO 4210, along with my recommendations on other steps that bike manufacturers should take beyond the standard for the good of their customers and the health of their business.

ISO 4210 outlines a process for testing the fatigue strength of components. Its testing requirements are built on three pillars: fatigue (caused by recurring loads); overloading; and impacts (which are less frequent events.) With relatively simple test setups, manufacturers can carry out ISO-compliant tests and ensure a certain degree of operational safety. If every bike and component were tested in accordance with ISO 4210, there would be far fewer component failures and subsequent accidents.

Good, but not good enough. However, the standard is inconsistent because it does not apply all three "pillars" to its requirements for testing bike components.

Pedals, for example, are required to undergo impact tests, but cranks are not. Yet there is no denying that a high load on a pedal, caused by a failed jump or a fall, is also transmitted to the crank and bottom bracket.

The standard also requires that some components be tested to different loads, even if, like a pedal and a crank, they are directly connected to one another.

Frames and forks are one example. Using the standardized falling weight, a carbon fork needs to be tested at a falling height of 640mm, while a road frame must be tested at a falling height of only 212mm.

The ISO standard also contains gaps. Forks must undergo a disc brake load test, but not frames.

One of the most egregious omissions concerns the steerer tube of a carbon fork. Although it is one of the most critical components of a road bike, there is no requirement in ISO 4210 that it be tested. Yet failures of carbon steerer tubes have forced many renowned bike brands to issue product recalls.

Higher standards. While it is crucial to test bikes in accordance with ISO 4210, it is not enough — and does not by itself ensure a safe bicycle. For this reason, some testing labs, including the Zedler Institute, and manufacturers have developed their own testing requirements that go beyond ISO 4210.

Recognized test labs use different criteria to differentiate between a bike's intended use and permissible total weight, and distinguish between electric and conventional bikes.

Manufacturers that seek to minimize product failures should establish their own, reasonable testing standards. Or, if they choose to partner with a testing lab, they should first ask these questions:

- Does the lab perform individual tests with one test piece — the preferred option — or does it use a new test piece for each load case — a poor practice that, absurdly, is allowed under ISO 4210?
- Does the lab complement the ISO-required tests with tests on such essential components that aren't mentioned in the standard, such as disc brakes, fork steerer tubes, the rear triangle on full-suspension frames, and, for impact tests, the rear triangle of all mountain bike frames?
- Does the lab vary test loads to account for different types of use? For example, mountain bikes should be tested at different loads depending whether they are intended for cross-country, all-mountain, enduro, freeride or downhill use.
- Does the lab use more realistic load types and levels beyond those stipulated by the standard?
- Does the lab perform material-specific tests?

Mechanical accuracy is another important and often neglected aspect of a test procedure. Test pieces must be mounted as realistically as possible — something not always specified by the standard.

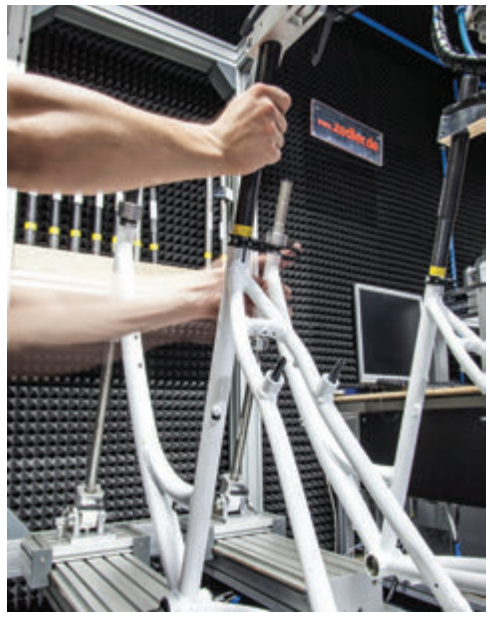
For example, dropouts should be tested only when they are clamped on the actual thru axles or quick-releases they are paired with, so that the loads acting on them better reflect real-world riding conditions.

Courting trouble. Why should manufacturers take these extra steps? One is to make safer bicycles, of course. If that is insufficient reason, manufacturers should also realize that merely complying with ISO or EN standards is not enough to protect them from liability.

Establishing a new standard is a sluggish process. By the time it become effective it is invariably outdated because the state of the art has evolved.

The Product Safety Act, which is in force across the European Union and, in almost identical form, in Australia and New Zealand, clearly states that a product must be designed, manufactured and, of course, tested to ensure that it and its components will continue to meet minimum strength and fatigue requirements for at least 10 years of normal use. (See Wednesday's *Eurobike Show Daily* for my column on the Product Safety Act.)

A judge can — and, indeed, must — take current research and reports in professional journals into account when determining whether a manufacturer should be held liable for a defective product.



Setting up a frame for testing at the Zedler Institute.

I know of a number of judgments against manufacturers in cases like these. One manufacturer was fined for using a technology that it knew was dangerous when it introduced the product on the market. Because there was no way to remedy the danger, the court ruled that the manufacturer should not have used the component as designed.

So while the ISO 4210 standard is a solid foundation for testing bicycles, it is not enough. Manufacturers must test far beyond what is stipulated by the standard, or a court may still find them liable for product failures. ■ **DIRK ZEDLER**

Dirk Zedler

Since 1993, Dirk Zedler has been an analyst and expert witness on bicycle accidents and product failures for courts, bike and insurance companies, and private individuals. He got his start in the industry by working for a large bike shop in 1986, and now holds the respected advanced engineering degree known as a "Diplom-Ingenieur."

Courts have recognized Zedler as an officially appointed and sworn expert on bicycles since 1994, and on electric bicycles since 2014. His staff prepares some 800 expert's reports every year.

Zedler – Institut für Fahrradtechnik und -Sicherheit GmbH (the Zedler Institute for Bicycle Technology and Safety) has used this wealth of knowledge, derived from its work in thousands of court proceedings and expert's reports, to enhance research and development in the bicycle industry.

The Institute sets the standards for the bicycle industry. It develops and builds testing equipment that is used by manufacturers to improve the riding quality and safety of their bikes, and by leading European bicycle magazines to test them. The Institute's work provides a basis for European and American manufacturers to communicate with their Asian suppliers. Manufacturers can buy test equipment from the Institute or use its state-of-the-art testing lab.

The Zedler Institute also prepares user manuals for bicycles and pedelecs. These manuals, now available in more than 35 languages, help consumers use their bikes properly — and in many cases have protected manufacturers from liability.

For more information, visit www.zedler.de.