



## Kirk Frameworks Company

[www.kirkframeworks.com](http://www.kirkframeworks.com)

1.800.605.KIRK

[info@kirkframeworks.com](mailto:info@kirkframeworks.com)

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# Fitting and Geometry

by David Kirk

*Designing a frame that will fit you perfectly and handle well is not rocket science but it's not simple either.*

The basis for any good fit is to have your three contact points in the proper relationship to each other. Finding these three points is fairly simple. I do it with a combination of accurate body measurements and measurements of bikes you currently own, factoring in whether or not they fit you well. All this information is equally valuable.

I feel it's important to note that there is no one "perfect fit" for a given rider but that there is a range of proper fit. Imagine a small circle around each of your contact points. If the bars, seat and pedals are kept within the circle then you'll have a very good fit. Depending on how the bike will be used the position can be tweaked within that circle. Your position on a cross bike should not be the same as it would be for a road race bike or for a track bike. A little lower and longer or a little higher and shorter can make all the difference.

*The most difficult part of this whole process, the part that separates the true professional designer and builder from the hobbyist, is taking those three contact points and integrating them into a complete frame design.*

Once the rider's three contact points are determined it's critical to make sure that the wheels are placed under the rider properly so as to give the best weight distribution and handling. Many fitters, even experienced trained fitters, feel that once they get the contact points established then the job is done. In reality it's only just begun. How the wheels are placed under those contact points and the rider's center of mass determines how a bike will feel and behave.

The proper choice of head angle, fork rake, resulting trail, bottom bracket drop, chainstay length, etc. will make the bike feel a part of you. It will do what you want, when you want it to with no compensation on the rider's part. A properly designed bike will carve through turns faster than you can imagine, climb with life and snap, and still feel smooth and relaxed while descending.

# Bike Handling

As stated above a bike that handles well does so due to the fact that it fits well and has the rider's weight placed well over the wheels. This is a pretty simple thing when you think about it. There is one common road block to this though. Pre-built forks with a stock rake. Most of the time these are made of carbon but not necessarily. The issue with these forks isn't that they are constructed of carbon but that the rake of the fork wasn't designed to complement the frame. If you are lucky and ride a 56cm frame then it might work out fine for you. If you don't then you can end up with a bike that fits well but handles poorly.

There are two big things affected by fork rake. Front center (the distance from the bottom bracket center to the front axle) and trail (a measurement resulting from the combination of head angle, wheel diameter and fork rake). Front center and trail are the main contributors to a frame's handling. So why is it then that when you look at a spread sheet of Brand X's frame and fork geometry that all the fork rakes are the same, regardless of the frame's head angle? The head angles will vary from  $70^{\circ}$  to  $74^{\circ}$  but the fork rake is always 43 mm. The trail on these bikes will range from 7.8 cm (very long – will result in very slow handling and low speed instability) to 5.3 cm (pretty darn short – will result in twitchy handling and high speed instability). The way to cure this is to match the fork rake to the head angle to give the proper trail. I like to build with a trail of about 5.9-6.0 cm for the best handling. You might ask why Brand X doesn't do the same. It's really pretty simple. With the advent of carbon forks with threadless steerers they feel that they have a one size fits all situation. So unless you happen to need the middle of the road frame size with the right head angle to work with the stock fork, you may end up with a bike that doesn't handle nearly as well as it should.

I feel strongly that the fork should be designed and built to match the frame's geometry and not the other way around. Somewhere along the line many have stopped thinking of forks as an integral part of the frameset package and more of a component like a seat post or water bottle cage. I design and build framesets where the fork rake will be what it needs to be to give the proper handling. If it needs 44 mm of rake then that's what it gets. If it needs 55 mm of rake....well you get the idea.

If you would like to have a carbon fork and if one is available in a size and geometry that will work with your frame, then I'll be happy to integrate it into the design of your bike.

If terms like rake, trail, and front center make your eyes glaze over then feel free to give me a call and I'll do my best to explain it to you without putting you to sleep.