



USA CYCLING BIKE MEASUREMENT



Photo David Wood 2007

Bike Measurement for USA Cycling Championship Events

Introduction

From the beginning of 2008, bicycles used in NRC races and National Championship events for riders with a racing age of 17 years and above must comply with dimensional and fit standards already implemented worldwide by the International Cycling Union, of which USA Cycling is a member federation.

USA Cycling Road Regulations 1J1

(e) Bicycles must meet current UCI technical regulations at events that select 17-18, U23 and elite riders for international competition or national teams. All bicycles used in Federation National Championship (for age 17 and older riders) and NRC races must comply with the current UCI regulations.

The intent of this article is not to discuss every possible dimension that is regulated for a bicycle in cycling competitions. It is intended to give you a clear understanding of what must be measured, generally how it will be measured, when it should be measured and issues that may affect a rider's fit on the bicycle for International competition and USA Cycling events as noted above.

The equipment regulations that are finally being enforced here are now approaching 11 years of implementation at the international level. Frame element dimensions are very specific, but manufacturers are largely maintaining this compliance. Don't assume, however, that all equipment complies with the regulations, especially older or custom designed equipment.

Bicycle Design/Dimensions

The general dimensions of the bicycle frame and wheels are not in question and are relatively straightforward to follow and are not discussed here. This does not mean they are unimportant; rather something you can review without interpretations. If you have a custom built bicycle or want to use a one of a kind design, you should review the following information in detail. (UCI Regulations Chapter 1-1.3.001)

<http://www.uci.ch/Modules/BUILTIN/getObject.asp?MenuId=MTkzNg&ObjTypeCode=FILE&type=FILE&id=34033&LangId=1>

The overriding principle required for frame design is a "double triangle", the front triangle formed by the seat, top and down tube, the second formed by the seat tube and rear wheel stays. For specific events, some variation is allowed in the frame design of a bicycle, specifically for track and time trial events. The familiar straight line, double triangle form is for mass start events for road and cyclo-cross. For time trial and track events, there is an allowance of a more free flowing design, although the same double triangle is evident if you just ignore the curves and connect the dots.



The bicycle above is legal. It has a double triangle configuration.



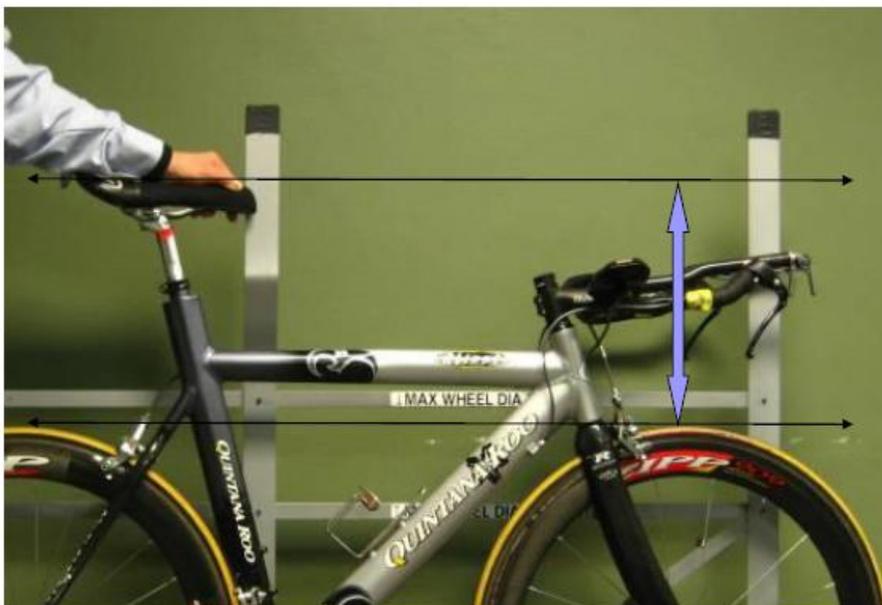
The bicycle above is not legal. It has no seat tube or seat stays.

Bike Weight

For all road, cyclo-cross and track events there is a minimum weight requirement of 6.8 kg (14.99 lb). Ultra light road bikes and many track bikes may weigh less than the minimum weight. These are not allowed without adding additional weight to the bicycle to achieve the minimum weight. Water bottles, tool bags, pumps and such items that can simply be removed from the bike are not counted in the minimum required weight.

Handlebars

The regulations limit the normal forward reach of standard handlebars to 5 cm beyond the front wheel axle. This does not include the brake levers. As with most bicycles, the manufacturing industry makes compliance happen almost regardless of the components or frame. Handlebars of any kind must be lower than a level line drawn from the top of the saddle. The lowest part of the bars must also be higher than the top of the wheels.



Wheels

Wheels must be of the same diameter, between 550 mm and 700 mm, including the tire. For mass start races if the wheel does not pass the test of being “traditional” it must be specifically approved by the UCI. The regulations define a “traditional wheel” as any wheel with a rim with any cross section dimension no larger than 2.5 cm and with a minimum of 16 metallic spokes, whose maximum cross section does not exceed 2.4 mm. Anything more exotic than this for massed start events must first be tested and approved by the UCI. The UCI maintains a web site with this information under the “Rules” tab. The publication, “Non-Standard Wheels in Conformity with Article 1.3.018” contains the latest approved wheels.

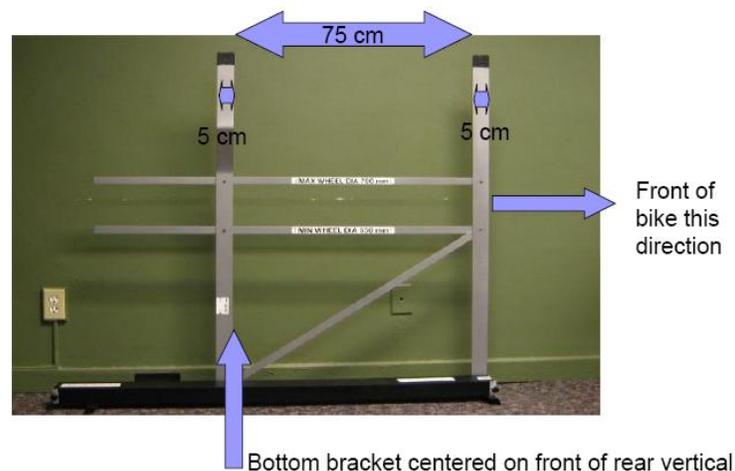
<http://www.uci.ch/Modules/BUILTIN/getObject.asp?MenuId=MTkzNg&ObjTypeCode=FILE&type=FILE&id=NDkyNTc&LangId=1>

There are currently over 150 wheels on this list. The wheels are listed by manufacturer. Some equipment is cross manufactured so make sure you know the wheel’s origin before assuming that it is not an approved wheel. Again, 11 years of international market compliance has seen the market become self-regulating on many fronts. With the popularity of triathlon, there is still reason to be watchful, however.

Bike Fit and Adjustment

The rider’s points of supports; saddles, handlebars and pedals, have dimensional and adjustment limits that affect the rider’s position on the bicycle. The regulations for rider’s fit on the bicycle vary between general endurance and pure speed events. First, the standard fit details are given. Following this, exceptions for body fit, or morphological exceptions will be reviewed.

For endurance or all mass start events; **road, track and cyclo-cross**, the nose of the saddle must be a minimum of 5 cm behind a vertical line drawn up through the center of the crank axle. For speed events (track); **sprint, 500m, 750m, kilometer and team sprint**, the nose of the saddle may move forward inside this 5 cm dimension, but never beyond the center of the crank. These measurements are made using a jig:



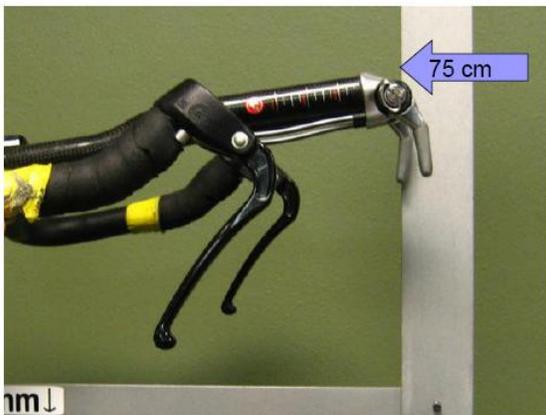


This saddle meets the standard dimension limits. It is 5 cm behind the bottom bracket axle.



This saddle is too far forward for endurance events, but is legal for track speed type events.

For time trial events, handlebar extensions may be added. These extensions may offer forearm support, but cannot be designed to allow pulling or applying leverage against the handlebars. **The maximum forward horizontal dimension of the handlebar extensions is 75 cm** and is measured horizontally from the center of the bottom bracket axle to the end of the extension. Handlebar extensions should be parallel or nearly parallel to the ground such that the rider's arms are parallel to the ground when in use.

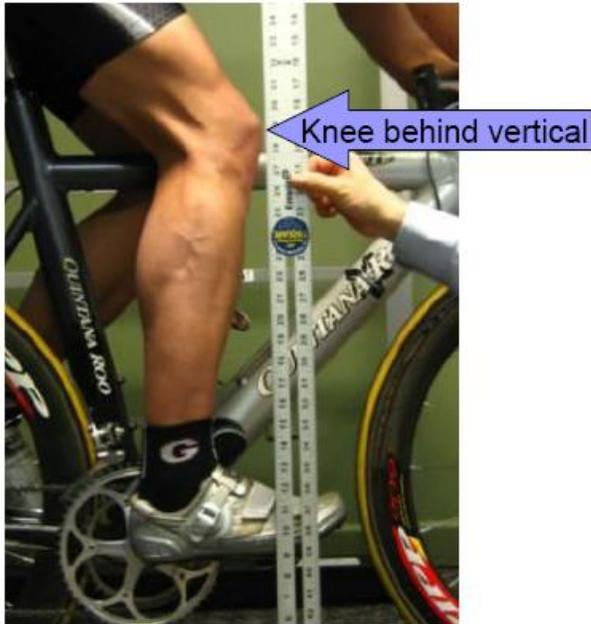


These bar extensions are at the limit. The shift lever bolt is right at 75 cm from the bottom bracket axle.

Saddle Position Morphology and Exceptions

One of the primary fit regulation issues is where the nose of the saddle can be in relation to a vertical line through the bottom bracket. As noted above, the regulation indicates the saddle must be 5 cm behind this line for most events. A rider whose saddle position is forward of this point, but no further forward than the center of the bottom bracket, must pass the following morphology test to be allowed to use this saddle position. Seated on the bike, with feet in shoes and clipped into the pedals, the foot/pedal is placed in the forward position (pedal horizontal-3 o'clock). In this position, the leading edge of the knee cannot be forward of the vertical line through center of the pedal axle. If the knee is

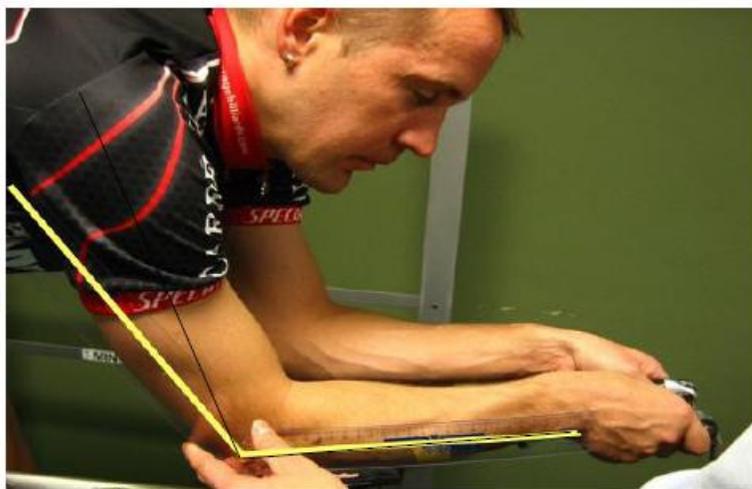
found to be forward of this line, the saddle must be adjusted backwards and the verification is undertaken again. If the saddle cannot be adjusted for proper compliance, a smaller saddle might be an option. The saddle must be between 24 cm and 30 cm in length. Shorter riders and those with small frames are more likely to need this fit test performed. Note that the rider may not slide off the back of the saddle to move the knee back for this test. In fact, a rider who has normal leg length and is over 5' 6" really has no business requesting this test as such a rider can easily attain a legal position simply by moving the saddle back.



This rider would pass the morphological test for the saddle position behind the vertical. Note that the rider must be in their true riding position when doing this test.

Handlebar Extension Morphology

Extensions, whether a clip-on device or full replacement of the handlebar, are designed to offer the rider a more aerodynamic position, with an extended reach. Enforcement of handlebar regulations is to regulate two things; “superman” position (extended forward reach) and a level arm position. The regulation limits a handlebar extension to a horizontal dimension of 75 cm measured from the center of the bottom bracket axle to the end of the extension. A rider with a longer extension, but only up to a maximum of 80 cm overall (another 5 cm) must pass the following morphology test in order to be allowed to use the distance between 75 cm and 80 cm. The rider is placed on the bike, again in the appropriate time trial position and the angle between the rider’s forearm and upper arm is measured. As long as this angle is not greater than 120°, the additional extension length, up to the 80 cm maximum, is allowed. The rider must reach to the end of the extension before this measurement is taken. If you do not use some portion of end the bar and don’t want it to be part of this measurement, then it should be adjusted back or removed. Riders may not slide off the front of their saddle to decrease this angle. **If a shift lever is added to the extension, the non-moveable portion of this device is counted in the overall measurement.** This test is more common for tall riders.



This rider passes the handlebar extension morphology test. His elbow angle is less than 120 degrees.

Timing of Bike Check

Plan accordingly. Just as 17-18 Junior's must have their bike verified for roll-out for the maximum gear of 7.93 meters (26'), all bikes must be checked for nearly all events. Bikes are normally checked or verified for each event, each time they are used. The emphasis of compliance review is largely focused on, but not exclusively, on time trial and track events. Bikes are first checked for overall equipment, weight and dimensional compliance. If all the regulations are met, the bike is passed with no further testing required. Assuming the equipment and weight are acceptable, but the dimensions (for saddle position, handlebar placement, handle bar extensions) are outside the standard allowable limits, the bike and rider must be checked for morphological fit exceptions. A check of the bicycle with the rider seated, with racing shoes attached to pedals and the rider in the appropriate riding position for the specific event, is done. Remember, it takes a few minutes to verify your bike's compliance even if everything is adjusted within the specified regulations. If you know that you require a test for exceptions as outlined in this article, report to the officials a bit earlier than normal. **Once a bike has been verified, however, it cannot leave the measurement area without being re-verified before the start of the event.**

We hope this essay has been useful to you. If you have any questions about bike measurement, please feel free to contact Shawn Farrell, USA Cycling Technical Director, at 719-866-3364 or sfarrell@usacycling.org