Waterford Custom Bicycle Ordering Guide

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Building your dream bike begins with understanding your dream. This booklet provides instructions and support on how to use the Waterford Order Form. The form lets us work together to specify each element of your bike's design from tubing technology to tire size. We have developed this comprehensive guide to ensure you enjoy many delight-filled miles on your Waterford.

Though you can complete the order form by yourself, we recommend collaborating and ordering through your local Waterford dealer. A dealer provides many important services that lead to and result in a great bike and buying experience, including:

- Fitting
- Component Selection
- Assembly
- On-going Maintenance and Support

Our order form and guide help you and your shop think through the many considerations involved in creating a custom bike. Investing time early in the process saves wasted effort down the road and ensures a more desirable result with a shorter production time.

We have organized our order form into four major categories of bike design:

- **Function**: How does the bike need to perform? Where will you ride? What components would you like to use? How much of a load will you want to carry?
- **Fit**: How does your body need to interface with the bike? This typically begins with surveying your existing ride and taking skeletal measurements. Then a fitter works with you to determine your body's points of contact on the new frame.
- **Feel**: Here we provide the opportunity to fine tune your ride. How do you want your Waterford to handle? How stiff or compliant do you want your bike to feel?
- **Finish**: How do you want your bike to look?

What the *?

You'll find *'s (asterisks) scattered throughout the form. These indicate choices that may require an extra charge. An asterisk doesn't guarantee a charge, but it should put you on alert, especially if you are concerned about cost. Waterford provides a complete quotation and all orders are confirmed before production can begin.

The order form is in an Adobe Acrobat format, allowing you to choose from two options:

-Print out the form and fill it in by hand.
-Download the file to your computer and fill in the form electronically. This allows you to save a partially completed form and collaborate with your shop for the remainder. When you are done, the shop is able to email the form to us.

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Function

In this section we define how your Waterford will function for you. This lets us develop a design that anticipates your use, component selection, and other attributes.

How will you use your bike? In a few words, please summarize how you will use your bike. Then allocate your percentage of use to different kinds of riding. This helps us understand your "big picture" vision.

Wheels: Most road bikes use 700c wheels unless otherwise specified. Proper fit and safety may dictate an alternative size. When frames are required to be small, 650c or 26" wheels are typically used. These smaller wheels offer better stability and acceleration for some riders. Keep in mind that gearing should be adjusted to compensate for smaller wheels.

Tires: List the maximum tire size (width) you would like to use on your new bike. This affects frame construction, design, and tube selection.

Brakes: Your brake choice is linked directly to your desired maximum tire size. Also, if you wish to mount fenders, you will need to choose a brake that provides the additional clearance needed to do so.

Below is a list of brake choices and their maximum tire size limits.

Brake Varieties



49mm Dual-Pivot
Up to 28C



57mm Dual-Pivot
Up to 28C plus fenders.



64mm Dual-Pivot
Up to 38C plus fenders



Linear Pull
Up to 2.1"



Cantilever
Up to 2.1" plus fenders.



Dsic Brake
No tire size limit.

Drivetrain: Most adult bikes employ derailleur shifting systems. However, a growing number of riders are adding fixed gear/ single speed bikes to their fleet as well as hub mounted shifting systems such as the SRAM 3x7, Shimano Nexus, and 14-speed Rohloff hub for which we recommend Paragon dropouts. Your drive train choice determines the type of drop out and cable routing needed.

Typical Drivetrain Configurations



Derailleur-based drivetrain.



Track/fixed gear horizontal dropout.



Paragon "slider" multi-purpose dropout

The choice of shifting system also determines your handlebar choices. Shown at the right is an example of the Rohloff hub shifter, which typically mounts to flat or tourist bars. When using the Rohloff shifter with drop bars it can only mount to the lowest part of the bars.



Rohloff-hub shifter

Loading / Racks: Your desired load capacity affects tube selection and steering design. We recommend front, as well as rear racks for loads over 20 pounds (10kg). If you plan to use a front rack please list the brand and model as the mounts are not standardized. We have a selection of front rack mount options that cover 80% of racks available. Mounting other racks may incur additional charges.

Popular Rack Choices



"Hooped" front rack (Tubus Tara)



"Hoopless" front rack (Tubus Duo)



Heavy duty rear rack (Tubus Cargo)



Light duty rear rack brake-mounted (Tubus Fly)

Light duty racks can mount off the brake bridge, avoiding the need for rack mounts. This can be desirable if you enjoy the clean look of a frame with a minimum amount of braze-ons.

Mark's Rack



For randonneurs, we offer standard mounts for Mark's Rack from Rivendell. This rack is designed to support a light handlebar bag.

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Fenders: We add eyelets and other mounts for fenders. Like front racks, fender mounts are not fully standardized. Upcharges may apply when special fenders from Honjo, Velo Orange, and other suppliers are specified.

Handlebars: Your handlebar choice dramatically affects how you fit your bike. Properly located drop bars remain the most comfortable configuration for distance riding. Flat and tourist bars shorten the reach and offer excellent short distance riding comfort, but the lack of hand positions makes them less desirable for most rides over 20 miles. Mustache bars offer multiple positions but require extended reach.

Popular Handlebar Styles



Drop Bars | Mustache Bars | "Flat" MTB Bars | Tourist Bars

Pedals: Your choice of pedals affects the required amount of toe clearance we calculate into the frame design. Clipless pedals do not require as much clearance as toe clips. Platform pedals require the most room since there is a tendency to push the ball of the foot well ahead of the pedal spindle.

S&S Couplers: S&S Couplers allow you to break down your bike so that it fits into a case that meets airline standards, reducing or eliminating baggage fees. S&S's carrying case and packaging accessories are sold separately.

S&S Couplers aren't for everyone:

- Large frames (many over 62cm) may not fit into an airline regulation case due to their size.
- The rider, or person who packs and unpacks the frame should have mechanical expertise. It may not always be needed, but without such expertise, you may not properly assemble your frame so that it is safe to ride. Also, with larger frames more components must be removed in order to fit into the case. This requires additional expertise in crankset and fork installation.
- Packing and unpacking takes time. Budget yourself 2-3 hours or more the first time with a coupler frame. This process can reduce to about a half hour under the right circumstances.
- Couplers are complicated to pack and unpack. If you travel less than three times a year, you may need to allow for extra time to "relearn" the packing process.

S&S Coupled Frame



Construction:

This section addresses how we will construct your frame and fork. Our clients choose Waterford because of our proven virtuosity in frame construction. We offer three categories construction:

- **33-Series:** Ideal for competition use featuring TIG-welded True Temper S3 and Reynolds 953 tubing. It is designed for riders looking for quick acceleration and light weight.
- **22-Series:** Our lug designs have achieved a world-class reputation for quality and workmanship.
- **14-Series:** TIG-welded OS2 construction means versatility and excellent performance in an economical package.

22-Series Options:

Waterford offers a wide range of lug options, starting with four popular lug profiles:

Italian Cut: These clean, minimalist lugs pay tribute to the classic Cinelli bikes of the 70's. It's available in 1" and 1 1/8" steerer configurations and is included in the base 22-series charge (as long as the design stays within lug angle constraints).



Italian Cut (Default)

Special edition lugs: Waterford offers two special edition lugsets, custom built for each individual frame. Custom building the lugs eliminates one of the major constraints in lug designs - restrictions on tube angles. Additional charges apply.



Empire (Custom Lug)

Empire (Art Deco): Edgy and sharp, this style takes you back to a time when industrial design first hit its stride. Available in 1 1/8" steerer only. Constructed of stainless steel, we build these lugs to match each individual's frame geometry.

Fleur de Lis: Feast on the delicious curves and windows of this design. Available in 1 1/8" steerer only. Constructed of stainless steel, we build these lugs to match each individual's frame geometry.



Fleur de Lis (Custom Lug)



Sachs Newvex Lugs (1" Steerer)

Newvex: Builder Richard Sachs patterned these lugs after the classic French Nervex lugs which dominated the high-end bike world from the mid-1950's to the mid-1970's. Available in 1" only.

Each of these profiles is available in a polished stainless as well as painted finish.

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22-Series Tubing Options: You can upgrade from Waterford's extensive palette of custom heat treated air-hardening tubes to Reynolds 953 high performance heat treated stainless steel. Some people prefer to upgrade the stays only. Additional charges apply.

Seatstay Treatment: This refers to the style of connection between the seatstays and the seat tube. Waterford typically uses the clean Fastback design. Side tack designs offer a more traditional look. With some stainless lug designs, side tack stays are required because of the limited lug surface area. 14-Series and 33-Series designs have fastback stay treatments.

Popular Seatstay Treatments


Side Tack - Plug-Style


Side Tack - Flat Cap


Fastback

33-Series Tubing: The default tubeset for the 33-Series Waterfords features True Temper's revolutionary S3 technology with its 38mm downtube and 32mm top tube. This combination provides torsional rigidity for fast acceleration in sprints and climbing. Its lightweight stayset keeps the frame vertically compliant.

You can also order a 953 version of the 33-Series design with a 35mm downtube and 32mm top tube. Thanks to the even higher mechanical performance of the main tubes, this version has all the great acceleration of the S3 version - yet in stainless steel. You can also mix the alloys - typically S3 main tubes with a stainless stayset.

Popular 33-Series Tubing Options


S3 Technology (Default)


Reynolds 953 (TIG Stainless/Brushed)


Mixed S3 Front / 953 Rear

Frame Details

Water Bottle Bosses: You can order your Waterford with up to three sets of water bottle bosses; on the seat tube, on the top of the down tube, and underneath the down tube. You can request other boss positions. An additional charge may apply.

Pump Peg: Pump pegs can be installed on frames that have sufficient head tube length between the top tube and down tube. Pump pegs are made of chromoly only. There is no stainless steel version for Reynolds 953 frames.

Chain Hanger: The chain hanger became a popular custom option in the late 1980's as a way to hold the chain when removing the rear wheel. No stainless option available.

Front derailleur braze-on: Waterford prefers clamp-on derailleurs because of the flexibility to change drivetrains without restriction. Waterford uses 28.6mm outside diameter seat tubes. Because we do not trust many 28.6mm clamps available we recommend using a quality 31.8mm clamp, shimmed down to 28.6mm using the recommended Wheels Manufacturing shims (available through your dealer or Waterford).



If you choose to use a braze-on, please specify the manufacturer (SRAM, Campagnolo, or Shimano) and the number of teeth on the largest front chainwheel. This allows us properly locate the braze-on.


Script W

Brazed-on Headbadge: Waterford can braze on two styles of polished stainless steel headbadges, script and block. Additional charges apply.


Block W

Rear Rack Mounts: An external chromoly rear rack mount option is included with your frame order. On stainless steel frames, Waterford rack mounts take the form of threaded bosses drilled into the seatstays (with a 2mm alignment tolerance).

Rear Eyelets: Waterford offers zero, one, or two eyelets as an option for most of its dropouts. Not all dropout styles have the ability to accommodate two eyelets.

Popular Derailleur Dropout Options


Standard - Stainless (0, 1 or 2 eyelets)

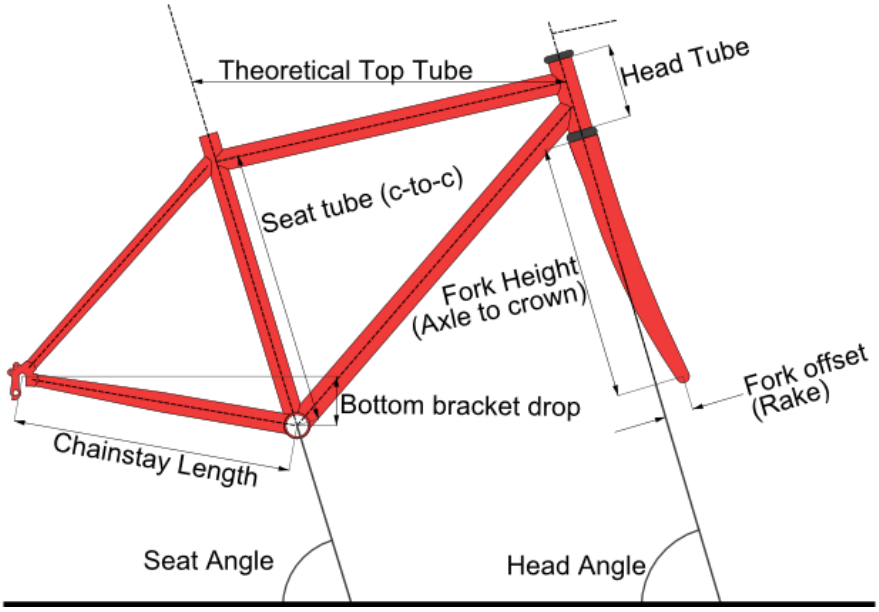

Artisan - Stainless (0, 1 or 2 eyelets)


Stainless Chainstay Disc (0, 1 or 2 eyelets)

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DIY (Do it yourself) Section

Use this section if you have a clear idea of the desired frame dimensions. Unless noted, dimensions are noted in millimeters (tolerance -/+1) and angles in degrees (+/-.25 degrees):



Seat tube: Measured from the center of the bottom bracket to the center of the top tube/seat tube intersection.

Top tube (theo): The theoretical top tube length, measured horizontally from the top tube/head tube intersection to the the centerline axis of the seat tube. This measurement does not always intersect the actual seat tube. Sometimes it intersects a line in space.

Head Tube: Total length excluding brazed on head tube extensions (22-Series only).

Head Angle: In degrees.

Fork height: The distance along the steer tube axis from the center of the front axle to the fork's crown race seat.

BB Drop: The BB drop is the vertical distance from the rear axle to the center of the bottom bracket.

Rear dropout spacing: This distance typically measures 120mm for track/fixed gear platforms, 130mm for geared road and cross bikes, and 135mm for off-road/disc/touring designs.

Chainstay Length: The distance from the center of the rear dropout to the center of the bottom bracket shell.

Head Tube extension (HTX): A value between 1 and 20mm on lugged (22-Series) frames. Head tube extensions are strongly discouraged on polished stainless steel lug designs because of the unavoidable visible seam between the lug and the extension.



No HTX



20mm HTX

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Fork:

Forks are sold separately from the frame. Waterford offers an excellent selection of composite forks as well as its legendary handmade steel forks.

For competition bikes, Waterford's composite fork options offer weight savings and vibration dampening characteristics. Select from suppliers including Ritchey, Wound Up, and Enve (Edge) Composites. If you already have a fork, we can accommodate your fork's specifications with most frame designs.

Waterford's steel designs truly allow us to match the fork to the frame, whether it's the superior shock absorption of our light weight race forks, our range of heavy duty touring forks, or our honest to God track forks. We can solve special fit and handling issues through our wide range of offsets and steer tube lengths.

Eyelets: Many of our crowned fork designs allow up to two dropout eyelets. Some, such as our unicrown designs, allow up to one eyelet. If you are choosing a Wound Up fork, you can add an eyelet for an additional charge.

Blades: Waterford offers several fork blade profiles. Road blades are light blades that are available straight or raked. For touring bikes, stronger blades are required when mounting a front rack. In order to provide lateral stiffness for track riding, track blades are round instead of ovalized, available in a 1" steerer only.

Rack Mounts: Unfortunately, rack mount locations are not standardized. We offer the following standard front rack mount configurations:

- Tubus Tara (Hooped)
- Tubus Duo (Hoopless)
- Blackburn Low-Rider (Hooped FL-1)
- Blackburn Customer (Hoopless CL-1)
- Rivendell Mark's Rack (Randonneuring Rack)

The Blackburn specifications are the closest to a standard. Please check with the supplier to make sure. Other racks involve a custom rack mount charge. We ask that you send in the rack so we can ensure a proper fit-up.

The table below presents our selection of fork crowns and designs with options and restrictions.

	Name	Steerer / Max Tire	Blades	Eyelets/Racks
	Boxtop (stainless or chromo)	1 1/8" / 50mm	Tapered; light or heavy duty; rake only.	0-2 eyelets;rack mounts optional; caliper or canty brakes
	Uni-Fork (chromo)	1 1/8" / 55mm	Heavy duty straight blade.	0-1 eyelet; rack mounts optional; cantiy or disc brakes.
	Sloped solid touring crown (chromo)*	1" or 1 1/8" / 40mm	Tapered; light or heavy duty; rake only.	0-2 eyelets;rack mounts optional; caliper or canty brakes
	Sloped straight blade (chromo)	1" or 1 1/8" / 35mm	Tapered; straight blade.	0-2 eyelets;rack mounts optional; caliper or canty brakes
	Newvex (stainless or chromo)	1" only / 38mm	Tapered; light or heavy duty; rake only.	0-2 eyelets;rack mounts optional; caliper or canty brakes
	Henry James (stainless or chromo)*	1" only / 38mm	Tapered; light or heavy duty; rake only.	0-2 eyelets;rack mounts optional; caliper or canty brakes
	Track Crown (chromo)	1" only / 38mm	Track (round) fork blades; rake only.	Caliper or brakeless (for track use only)

* - available only on request.

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Fit

One major factor that drives people to choose a custom bicycle frame is the need to achieve a proper fit not available from so-called "stock" designs. Waterford includes made to measure geometry (within certain limits listed below) on all 14-series, 22-series and 33-series models.

We recommend availing yourself of professional fitting services, particularly if you have fit issues with your current bike. Most Waterford dealers have extensive experience and/or formal fit training to help you achieve your ideal riding position.

Waterford looks to achieve three fit related goals:

- **Biomechanical efficiency:** Exercise physiologists look at the human body as a system of levers and pulleys, With the right position, these levers can work efficiently. In the wrong position, they can cause injury as well as suffering. We recommend evaluating biomechanical efficiency in light of the type of riding. Efficiency will be defined differently for a time trialist than for someone building a cafe bike.
- **Comfort:** Riding comfort is one of the principal indicators of biomechanical efficiency as well as a natural objective of bike fit. If you comfortable you will perform better.
- **Degrees of freedom** to adjust a fit over time: Your ideal bike fit is truly dynamic, changing in small measure from day to day and even over the course of a ride. Certainly over the life of your Waterford, most people can expect the need to adjust their fit. We take pains to consider the need to adjust the stem height and length, the saddle height and fore/aft position and so on when designing a bicycle frame.

The order form has two levels of fit information:
Basic fit information helps us anticipate your needs when designing your Waterford.

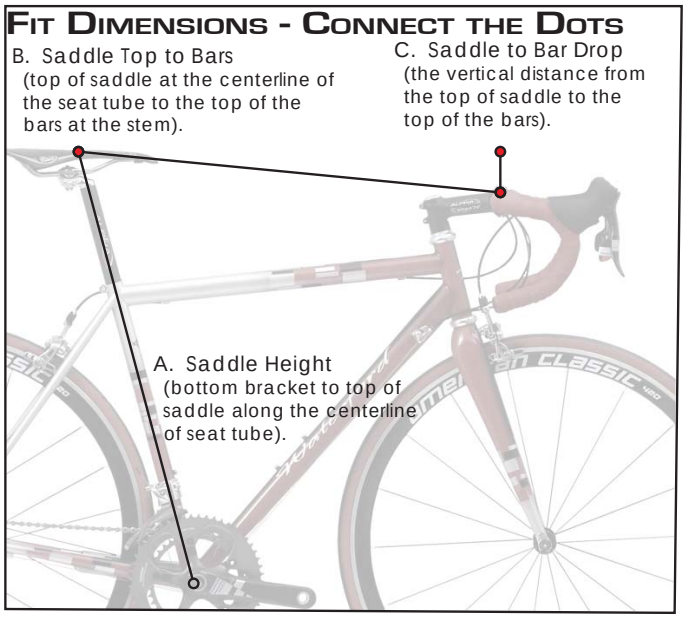
Height, weight and age provide a general context for the fit, while providing a cross-check on other specifications.

To specify the fit, we need to locate the saddle and handlebars in relation to the center of the bottom bracket. With this information, we can design the ideal frame to fit underneath.

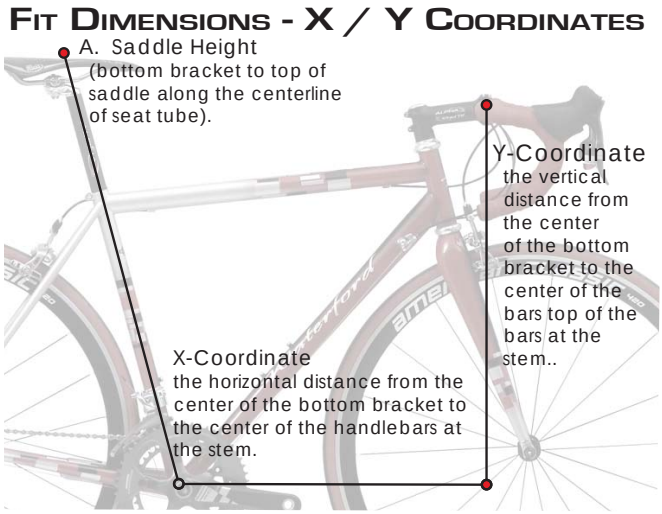
To locate the saddle, we need a saddle height and a recommended seat angle. The saddle height is measured along the centerline of the seat tube, with the saddle located in the middle of the saddle rails. This locates the saddle in relation to the bottom bracket. In some cases, we may request an adjustment to the seat angle to prevent excessive toe overlap.

There are two methods for specifying the handlebar position:

- **Connect the dots**: This method is designed to locate the bars and saddle without the use of special tools:



- **X/Y coordinates:** With this method the horizontal ("X") and vertical ("Y") distance is determined from the center of the bottom bracket to the center of the handlebars.



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Then we need to collect information to address possible issues with toe to front wheel overlap. **Toe overlap** refers to the amount by which the toe of the shoe can overlap the front wheel during certain parts of the pedal stroke. It's great if it can be avoided altogether, but as that frame size gets smaller, the risk and extent of toe overlap increases, necessitating changes to the frame and fork design.

In extreme cases, toe overlap represents a safety issue, particularly on fixed gear bikes, which is one reason Waterford pays attention to it.

Some riders willingly accept some amount of toe overlap in order to achieve their desired handling, a required wheel size, and other objectives. We ask for an appraisal of your tolerance of toe overlap to ensure a proper design. What can we do to reduce toe overlap?

- Steepen the seat angle.
- Lengthen the top tube.
- Slacken the head angle (and increase the fork offset).
- Choose a smaller front wheel/tire/fender combination.

Waterford requires a sign-off on toe overlap risk either by you or the dealer.

Cleat position: The typical foot position is to locate the ball of the foot directly over the pedal spindle. This provides an excellent combination of leverage and support for the foot while pedalling.

Long distance riders can push the cleat rearward on their shoe. This reduces friction and saves wear and tear on the foot, at a modest cost in power. By pushing the cleat rear ward, the degree of toe overlap is increased.

The Waterford Fit Studio



Though shops differ in their approach, more and more are developing professional fit studios. Shown here is an excellent studio that uses the Fit Kit System as well as the Waterford Fitmaster for the more advanced parts of the fitting.



Mixte Design: Mixte refers to whether you specifically want a mixte-style bike.

Fit Kit Rider Inventory: We've long been fans of the Fit Kit System, both as a tool for basic bike fitting and as a foundation for custom bike fits. Fit Kit is the most widely used fitting system in North America, with the most reliable measuring tools around. Fit Kit measurements and appraisals should be made by a trained Fit Kit professional.

Even if you don't have a full Fit Kit as part of your fitting statistics, we strongly recommend getting a Fit Kit inseam measurement. Fit Kit's inseam tool performs this best, but you can accomplish a good approximation with the following protocol (which requires a measurer as well as yourself):



Inseam with Fit Kit inseam tool

Stand against a wall in stocking feet. Using a large coffee table book, the assistant pushes the spine of the book firmly into the crotch between your legs (Fit Kit recommends a 20-25 pound force), measuring the distance from the spine of the book to the floor.



Inseam measured using large book.

The inseam is an important indicator of the maximum average bike standover height. Other Fit Kit measurements and appraisals should be made by a trained Fit Kit professional.

Existing Bike Appraisal: Another handy cross check is to measure your existing bike. This provides us a window into your riding habits as well as a basis for addressing complaints about your current fit. We request the same "Connect the Dots" measurements described earlier.

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Feel:

"Feel" refers to two of the more subtle components of a Waterford design - handling and stiffness.

Handling:

Handling refers to how the bike steers. It is determined by a variety of factors:

- Head angle
- Fork offset (a/k/a rake)
- Bottom bracket height
- Wheelbase

Complicating these factors is the matter of fit, which may dictate a head angle in order to avoid toe overlap.

The best way we've found to describe the spectrum of handling possibilities is to relate it to typical types of applications, which is how we set up our form:

- **Road Race**: Refers to an American mix of road racing, which consists primarily of criteriums. It's designed for quick steering and acceleration.
- **Stage Race**: This is what we'd design for a Tour de France competitor: quick climbing but stable descending.
- **Road Sport**: Designed for a more balanced range of riding - mostly club or century rides, spiced with an occasional time trial or triathlon.
- **Sport Touring**: Randonneuring - distance riding at its best.
- **Touring/Adventure Cycle**: Unsupported touring with heavy loads.
- **Off-road**: Where stability is key.



In the past, these were also model names, which implied the type of brakes, drivetrain and carrying capacity is involved. Today, we let you mix and match handling with alternative component configurations.

Team Mack rider John Fleckenstein takes a tight turn at the 2010 Superweek races.

Not every combination works: Heavy loads are hard to handle and benefit from more stable steering. We prefer to design the the handling to handle conditions that demand the the most stability. It's better to have steering that is more stable than ideal in a race than one that's too twitchy for descending with a load.



Dave found it better to design for the toughest terrain than for his racing interests.

Stiffness:

Parallel to this is how we design stiffness into each bike. Waterford offers an extensive palette of tubes that gives us the ability to tune the ride feel in a number of ways. This is supplemented by the geometry itself. The longer the wheelbase, for example, the smoother the ride.

Riding Preferences:

Finally, it is helpful to accommodate a preferred riding style. For example, let us know if you like to sprint, so we can factor in extra stiffness. Be sure to make your choice in light of the use of your Waterford.

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Waterford offers just about the widest range of colors you can find in the world. We use the finest PPG show car paints on our carefully surface-prepared frames.

The form lets you select from twenty or so of our most popular colors. Supplementing this are hundreds of colors from our PPG Color Guide, which you and/or your dealer can order from us. The Guide includes many special effects colors such as the Crystal Pearl, Liquid Crystal, Luminescence, Prizmatique and Flamboyance palettes. Special effect colors require an extra charge.

We can also match colors from appropriately sized samples provided (there is also an upcharge for this service).

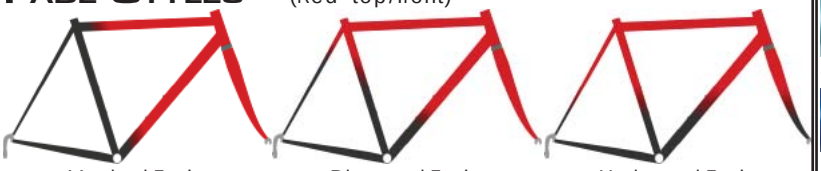
Decals:

Waterford offers two styles of decals, the Classic ("Block") and the Artisan ("Script") decals. Both are two color decals, with a main color and an accent color.

Fades

fades have been a staple of the racing set for years. Waterford offers many popular configurations. Below we highlight the three most popular choices:

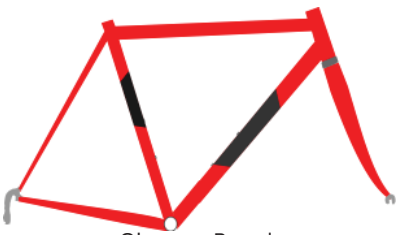
Fade Styles* (Red=top/front)



Vertical Fade | Diagonal Fade | Horizontal Fade

Panels and other Masking:

Another widely chosen styling is to add one or more panels or other special masking. Below are the typical styles. You'll also find a drawing on the order form which lets you create your own stylings.



Chevron Panels



Cross-cut Panels



Two-Tone (front-to-back)



Painted Head Tube

Colors

Purple Pearl

Garnet Met

Intense Red

Royal Red Met

Burnt Copper Met

Sunshine Met

Solo Yellow

Lime Sublime Met

Chameleon Met

Sky Blue Met

Blue Flame Met

Daytona Blue

Road House Blue

Gloss Black

Charcoal Silver

Sterling Silver

Vanilla Shake

Pearl White

White

Decals

Classic (Block)

White/Silver Classic | White/Black Classic

Silver/Black Classic | Gold/Black Classic

Silver/Red Classic | Black/Gold Classic

Blue/Silver Classic | Black/Silver Classic

Purple/Silver Classic | Ivory/Black Classic

Yellow/Silver Classic | Yellow/Black Classic

Red/Black Classic | Red/White Classic

Outline Black | Outline White

Outline Silver | Outline Gold

Artisan (script)

Black/Gold Script | Black/Silver Script

Gold/Black Script | White/Black Script

Red/Black Script | Chrome Script