THE CANNONDALE FRAME

At Cannondale, we've looked at bicycling from the cyclist's point of view for years. Now we have built a revolutionary bicycle frame that is ideal for long distance touring, time trailing, and everything in between. Despite a long wheelbase that provides touring stability, the frame is extremely responsive to pedaling due to its remarkable stiffness. This rigidity is achieved through our use of large diameter aluminum alloy tubing, which gives our frame greater resistance to flexing than conventional steel frames. Whether pedaling up a steep hill with loaded panniers, or breaking into a sprint, you'll feel the difference a Cannondale frame makes.

Cannondale cycling performance is available two ways. You can choose our complete Sport/Touring bicycle, the ST-500, equipped with an intelligently selected group of components. Or you can build up your own cycling machine with a Cannondale frameset, the ST-300. For sport riding or long distance touring, any type of recreational road riding, you will find that a Cannondale Sport/Touring bicycle or frameset will add a dimension of excellence you never thought possible.

ABOUT ALUMINUM AND LARGE DIAMETER TUBING

We selected aluminum alloy for our frame only after careful study of the several materials available. Traditional steel tubing has served the cyclist well, but has always meant a compromise. To get the stable ride of a long wheelbase, cyclists have had to put up with a whippy (and often wimpy) frame. As a result, many cyclists are under the misconception that flexibility is desirable in a touring frame. The fact is, however, that the more flexible the frame, the less efficient is each pedal stroke. Energy that should be transmitted to the wheel is wasted flexing the frame, causing a sluggish, tiring ride.

We know that a tourist needs efficient pedaling as much as any other cyclist, so we decided to build a frame that combines touring performance with responsive stiffness. Our aluminum alloy frame has a better strength to weight ratio and is far more resistant to torsional and bending deflection than even the finest steel bicycles. How do we achieve this edge in strength and stiffness? We use large diameter tubing.

To demonstrate how the diameter affects strength and stiffness, let's compare Cannondale tubing to one of the best known, most highly regarded steel bicycle tubes, Reynolds 531.* For this comparison we will use the down tube because it is the keystone of the bicycle frame. The equations and figures we will need are in the following tables:

TABLE 1: Equations for relative strength and relative stiffness

$$\text{strength} = (D^3 - d^3) \times Sy$$
$$\text{bending stiffness} = (D^4 - d^4) \times E$$
$$\text{torsional stiffness} = (D^4 - d^4) \times G$$

where D = outer diameter of the tube
d = inner diameter of the tube
Sy = typical yield strength
E = modulus of elasticity
G = modulus of rigidity

*We will use the figures for the butted section after brazing. The overall strength of a Reynolds tube will be less than the numbers we will derive because most of the tube has a smaller wall thickness than the butted section.