

TABLE 2: Diameters, strength, and stiffness values of two bicycle down tubes.

	Cannondale 6061-T6 aluminum alloy	Reynolds 531 steel* (butted section after brazing)
D	1.5 inches	1.125 inches
d	1.368 inches	1.046 inches
Sy	40,000 psi	89,610 psi
E	10×10^6 psi	30×10^6 psi
G	4×10^6 psi	12×10^6 psi

*Based on manufacturer's literature.

Using the strength equation from Table 1 and plugging in the appropriate figures from Table 2, we find that the relative strength for the Cannondale down tube is 32,600, while for the Reynolds 531 down tube it is 25,091. Expressed in ratio form, this is

$\frac{32,600}{25,091}$, which becomes $\frac{1.30}{1}$, or 1.30 to 1.

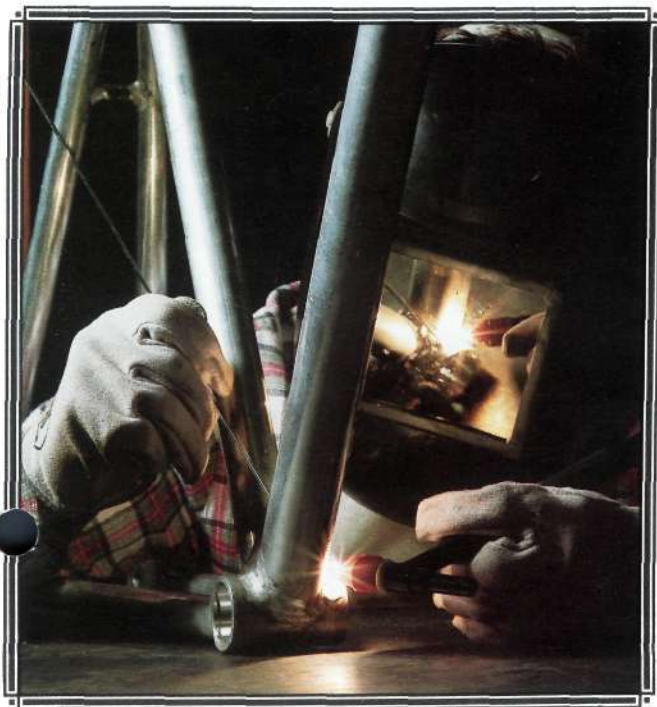
This means that a Cannondale down tube is 30% stronger than a Reynolds 531 down tube.

There are two types of stiffness that affect the responsiveness of a bicycle frame: bending deflection and torsional wind-up (twisting). The stiffer the tubing, the more efficient is each pedal stroke because less energy is wasted flexing the frame. Plugging the appropriate figures into the two stiffness equations shows that the relative bending stiffness for the Cannondale down tube is 15.60×10^6 , and that for Reynolds 531 is 12.15×10^6 , while the relative torsional stiffnesses are 6.24×10^6 and 4.86×10^6 . In ratio form for both instances, the Cannondale down tube has a 1.28 to 1 advantage over Reynolds 531; that is, 28% greater stiffness.

The three equations in Table 1 show that tube diameter has a great effect on strength and stiffness. You can increase the stiffness of a steel frame by making the diameters larger, but then your frame would be far too heavy for practical use. Aluminum provides the optimum balance of strength and stiffness with weight. Our frame weighs in at less than 3.6 pounds, about half a pound lighter than many of the best steel frames.

FRAME CONSTRUCTION

From the drafting table to your local bike shop, the Cannondale Sport/Touring bicycle is the product of intelligent design and careful craftsmanship. Every step in our production process has been developed to assure that a Cannondale frame represents fine American quality. Construction is performed entirely at our factory in Pennsylvania by trained, highly skilled personnel. They take pride in the quality of their work, so we can be certain each frame meets our strict standards.



Our tubing is precisely mitered to within strict tolerances, then it is securely and accurately fixtured for TIG welding by our trained welders. TIG (Tungston Inert Gas) welding is the strongest way to join aluminum. It is a sophisticated process using an electrical arc shielded by inert gas that makes clean, strong aluminum welds. The welds on a Cannondale frame are the work of skilled professional craftsmen.