Tensile Strength VS. Working Load

The Tensile Strength is the load at which a new rope, tested under laboratory conditions, can be expected to break. Rope strength is the approximate average for new rope tested under ASTM test method D-6268. To estimate the minimum tensile strength of a new rope, reduce the approximate average by 20%. Age, use and the type of termination used, such as knots, will lower tensile strengths significantly.

One area of misunderstanding that needs to be brought to the surface is the proper interpretation of rope strength, appropriate usage, and care. Let's start by defining two important terms: "tensile strength" and "working load". Tensile strength is the average strength of new rope under laboratory conditions. This is determined by wrapping the rope around two large diameter capstans and slowly tensioning the line until it breaks. The manufacturer's recommended working load is determined by taking the tensile strength and dividing it by a factor that more accurately reflects the maximum load that should be applied to a given rope to assure a comfortable safety margin and longevity of the line. Of course, that factor varies with the type of fiber and the weaving construction. There are however always exceptions, most notably the fact that rope is susceptible to degradation and damage in numerous ways that are not controllable by the manufacturer.

It may surprise you to find out that the working load for most kinds of rope is between 15% and 25% of the tensile strength. Now consider the fact that any time you tie a knot in a rope you effectively cut the tensile strength in half. The knot when tensioned cuts the line. While certain kinds of knots damage the line less than others, the 50% loss of tensile strength is a good general rule to live by. Research has shown that the figure 8 knot reduces the tensile strength by approximately 35% instead of 50% for other common knots tested.