

## Choosing a Material for Your Cordelette

Prepared by the Seattle Mountaineers Climbing Committee  
© Copyright 2001 The Mountaineers

The cordelette is a useful piece of climbing gear for equalizing anchors or for applications where a triple runner would be used. A variety of cords are available for making cordelettes, each with advantages and disadvantages. For the Intermediate Climbing Course, rather than specifying a material for your cordelette, the decision is left to you. Thinking through this decision will introduce you to the on-going process of evaluating climbing equipment and techniques, then making decisions based on facts and what makes sense to you. In this case, as in many of the choices you will make, there is no “right” answer.

Here is some background on the force exerted in a fall and how that impacts the design and choice of climbing equipment. Forces are usually expressed in the metric unit of kilo-Newtons (kN). For reference, if you and your pack weigh 220 pounds, you are exerting a force of 1 kN on the ground. Impact forces are a lot higher, and 12 kN is about the most your body can take without serious injury. For that reason we climb with dynamic ropes that limit the maximum force to about 10 kN. Also consider that during a leader fall the force on the anchor is nearly double (actually 1.66 times when you consider friction loss across the carabiner). With the dynamic rope, the maximum force on the anchor may be  $(10)(1.66) = 17$  kN. UIAA minimums for slings and carabiners are higher than that, at 22 kN and 20 kN respectively.

Four cords that are available in Puget Sound area climbing shops are briefly described below. You may find others. A summary table is presented after the descriptions.

### **7 mm Perlon (nylon core, nylon sheath)**

You are already familiar with Perlon cord – you used 6 mm Perlon for your Prussik slings. It is the common mountaineering accessory cord, and has been available for many years. For a cordelette, 7 mm is the standard size, though some climbers have used 6 mm. Perlon loses little strength when knotted and withstands repeated flexing with no loss in strength. Its disadvantage compared to high-strength cords is greater weight and bulk. However, at 40¢ per foot, this is your cheapest option (\$8 for 20 feet).

### **5.5 mm Spectra (Blue Water Titan; Spectra/nylon core, nylon sheath)**

Spectra is a form of polyethylene that is stronger per unit area than steel, with only one-tenth the density. It is a popular material for sewn runners. A 5.5 mm strand of Blue Water Titan Spectra is stronger than 7 mm Perlon, making it a promising cordelette alternative. However, Spectra loses almost half its strength when knotted with a Figure Eight knot. So in use, Spectra’s advantage in tensile strength is lost once it is knotted. However the cordelette will be lighter and less bulky, though more expensive at \$1.05 per foot (\$21 for 20 feet). A consideration with Spectra is that it has a low melting point, and therefore is not recommended for use with friction knots. Spectra cord must be tied with a triple fisherman’s knot because the core is so slippery that it can pull through a double fisherman’s knot under load.

### 5.5 mm Spectra-A (Maxim; Spectra/Kevlar core, polyester sheath)

Spectra-A uses Kevlar aramid fiber to make a really strong cord for slinging chocks. Some climbers have used it for cordelettes, however there was always a concern about loss of strength after repeated flexing. The Kevlar fibers are so strong that they can cut through each other and weaken the cord. This tendency was demonstrated in a severe flexing and bending test where Spectra-A lost 40% of its strength after 200 flexes. So while the Spectra-A starts stronger than Perlon, it loses 39% of its strength when knotted and another 40% upon repeated flexing. These strength losses will discourage most climbers from using Spectra-A, even though when new it makes a stronger cordelette than Blue Water Titan Spectra. It is the same price per foot as regular Spectra, so 20 feet will cost you \$21.

### 5 mm Gemini or Tech Cord (Black Diamond and Maxim; “Technora” aramid core, polyester sheath)

“Technora” is the newest material of the four and is an aramid like Kevlar. Its main application is for slinging chocks, however its 5 mm diameter has made it attractive to some climbers as a cordelette. While starting with the highest tensile strength, it loses the most strength of the four upon knotting with a Figure Eight, a startling 60% reduction. It also loses strength upon repeated flexing. At \$1.65 per foot, this is the most expensive cord of the four (\$33 for 20 feet).

#### Strength Comparison of Prospective Cordelette Materials\*

Material	Tensile Strength (Single Strand)	Loss in Strength When Knotted with a Figure Eight	Cordelette Strength (One Anchor)	Loss in Strength After 200 Flexing/Bending Cycles	Cordelette Strength after 200 Flexing/Bending Cycles†
7 mm Perlon (Sterling)	12 kN	8%	22 kN	0%	22 kN
5.5 mm Spectra (Blue Water Titan)	17 kN	47%	17 kN	6%	16 kN
5.5 mm Spectra A (Maxim)	18 kN	39%	23 kN	40%	14 kN
5 mm Gemini (Black Diamond) aka: Tech Cord (Maxim)	22 kN	60%	18 kN	45%	10 kN

\* These data are taken from “Comparative Testing of High Strength Cord,” presented by Tom Moyer and Chris Harmston at the International Technical Rescue Symposium in October 2000. Cordelette strength was evaluated by slow pull tests of a single arm of the cordelette, which was tied with an overhand knot. Drop tests were also conducted, and the strengths were nearly identical.

† These values are calculated and not test results. It is interesting that once you consider the loss in strength due to flexing, the materials with the highest tensile strength make the weakest cordelettes. Your final choice becomes a trade-off between strength and weight/bulk, with 7 mm Perlon and 5.5 mm Blue Water Titan Spectra being the two most popular choices.