

About Ageing of Climbing Ropes

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Ropes age due to use. Pulling a rope round a rock edge or through karabiners and pulling it under a body's weight through the figure of eight when abseiling and bottom lowering damages a rope in the course of time. Thus the ropes also get shorter in time, in some cases up to 10%.

Ageing caused only by storage can almost be neglected compared with ageing during use. This also holds for ageing by the influence of ultraviolet radiation; ropes may lose their colour with time, but virtually no loss of strength (more precisely, no loss of energy absorption capacity over an edge), because since the beginning of the 1960's all perlon and nylon (polyamide) has been UV-stabilised.

The decrease in energy absorption capacity depends on the metres of use; for single ropes this can be seen in the following plot (metres of use = metres of climbing + metres of abseiling). The upper part of the hatched area is valid for multi-drop ropes (11 mm diameter, 10 drops), the lower part for normal ropes (10 mm diameter, 5 to 9 drops; "-drops" = number of drops according to UIAA Standard 101 / EN 892. This means very severe drops, in fact fall factor about 1,75 and static belay).

When loaded over a rock edge a very often used rope holds less than a less often used rope, and such a rope holds less than an almost unused rope, and this less than a new rope (all for the same model of rope). So if you always want to have optimum chance of survival with respect to rope breaking caused by a sharp rock edge, you have to use a new rope for every mountaineering or climbing tour. But even a millionaire will not afford this.

Optimum chance of survival in this respect is not a 100% guarantee of survival. Even the best and newest rope may break if loaded over a sharp rock edge, even at the first drop (see below). Many of the

fibres get cut and the remaining fibres tear through. The rock edge just has to be a little sharper and/or the drop a little

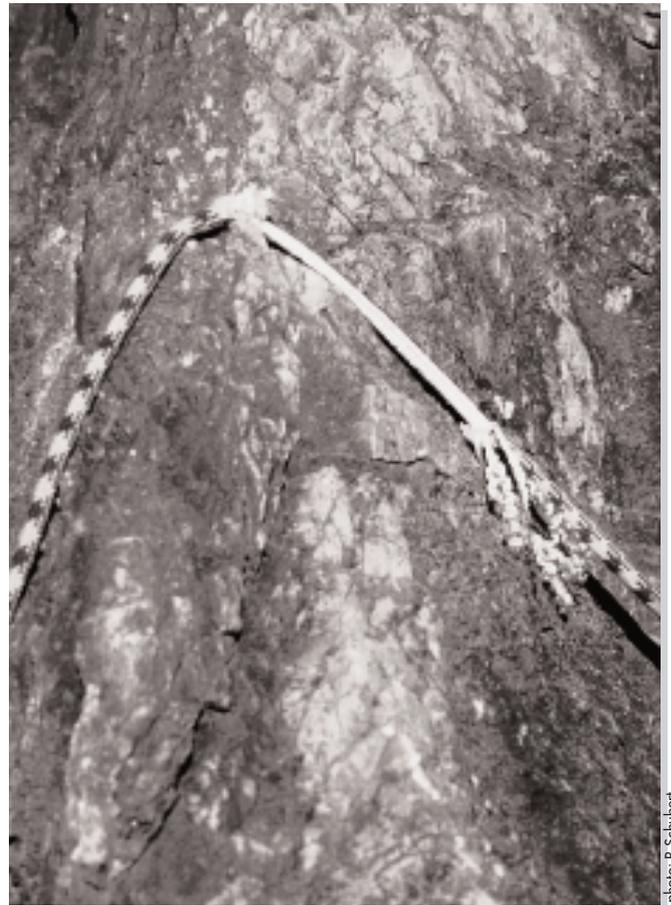
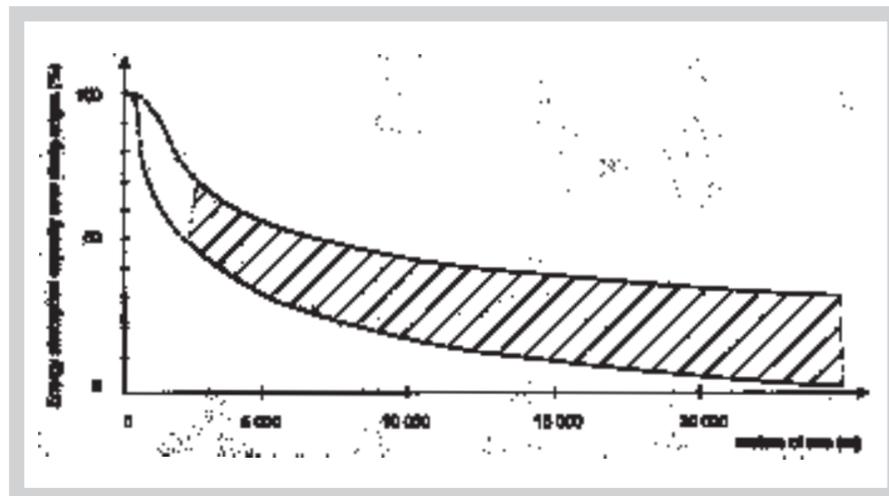


photo: P. Schubert

Fig. 1: A rope loaded over a rock edge; at first the sheath breaks, after that the core



longer and/or the fallen climber a little heavier than a normal body weight.

But statistically, the danger of such a rope breaking is very small: eg. in the last 17 years among German and Austrian climbers there was only one (!) such rope breaking caused by the influence of a sharp rock edge (Hörndlwand near Berchtesgaden, 1993), despite the fact that there is a very large number of falls in sport climbing, surely tens of thousands per year.

In practice, today's ropes will neither break in the attachment knot, nor at the

karabiner of a running belay, where the rope is pivoted in the case of a drop, nor in the partner belay, no matter what belay method is used: the HMS knot, the figure-of-eight, or any type of brake plate. And in the free rope length a rope will not break in any case.

These facts also hold for 10- or even 15-year-old ropes. This has been proved by many tests of such old ropes (not even 25-year-old ropes and one 30-year-old rope broke in tests in accordance with the standard; they still held at least one drop; this means that they will not break in practice, unless loaded over a sharp edge, in which case they may break).

Fig. 2: A broken rope, which was loaded over a sharp rock edge (a real accident, the climber was killed); the end where the core is visible is always found to be attached to the fallen climber; the other end, where there is sheath without core in it, is always attached to the belayer.

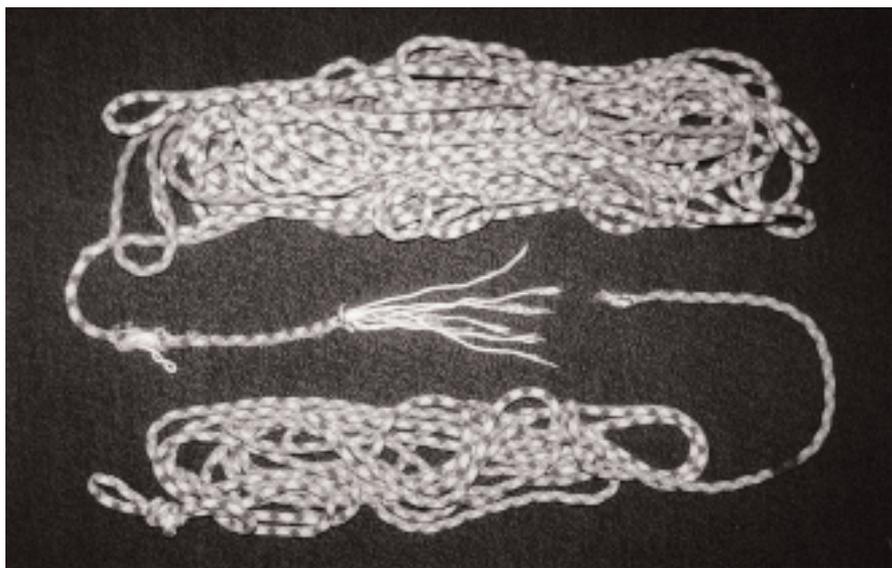


photo: P. Schubert

A rope need only be discarded when the sheath has been damaged such that the core is visible. Once this occurs, further sheath damage may quickly take place during further use, to the extent that the sheath will break. A rope with broken sheath cannot be handled. In particular, it cannot be used for abseiling. However, even in this case, there is no danger of the rope breaking, except when loaded over a sharp rock edge.

If the reader does not believe these statements and becomes anxious if his used rope is strong enough or not, he should use it for bottom lowering, or abseiling, or on glaciers. In these cases a rope will not break, because of the low load.

But all acids are very dangerous! During the 17 years quoted above with only one rope breaking at a sharp rock edge (at Hörndlwand), there have been four (!) rope breakages in Germany and Austria proven to be due to the influence of sulphuric acid (liquid from batteries?). By now, also in Britain several such rope breakages became known, and in the US and in Canada one each. In all cases, other than Britain, it was due to sulphuric acid. In the British cases, wherever the acid was known, it was also found to be sulphuric. However, in all cases except one nobody could find out how the sulphuric acid came into contact with the rope; in the

one case, it can be assumed that it was battery acid, because the rope had been stored in a camper van of a German mountain rescue team for some years.

The damage by any acid has the problem that it cannot be recognized on the rope; there is no visible indication of its presence.

The PPE¹⁾ Regulations in the EU

¹⁾ PPE = Personal Protective Equipment

(European Union) require the manufacturer's indication of time of use in the instructions for use. Such indications may be as follows: "Four years if rarely used, two years if often used, one year or even less if very often used." Of course, the question arises, what is "rarely used" and "often used".

Of course, every indication of time of use is just a rough estimate like a house number. Why?

If a rope is not loaded over a rock edge by a fall, even a 10- or 15-year-old rope will not break (influence of sharp edges and any acid of course excluded).

However, if a practically brand-new rope is loaded over a sharp rock edge within the minimum time of use indicated by the manufacturer, it may break at the first drop. One such case has been documented: A rope of the mountain troops of the German army broke on the first fall in the Laserzwand in the Dolomites (1981), on investigation found to be cut over a sharp rock edge. It was known from the log book that the rope had been used only for 10 hours and that it had not been loaded by a fall during this period. The army mountain guide fell to his death.

This shows the doubtfulness of any indication of time of use for ropes. Conclusion: If you want to survive whilst climbing and mountaineering, please do no fall so that your rope comes tight over a sharp rock edge, and do not touch the rope with any acid!

A further possibility for reducing the danger of rope breaking due to the influence of a sharp rock edge is using two half ropes or twin ropes (2 x 8 mm or 2 x 9 mm diameter); with two ropes there is redundancy: If one rope breaks, there is a second one to absorb the remaining fall energy. Up to now, no complete breaking of two ropes became known.



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