Lowering Off and Abseiling – a Huge Difference

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Lowering off over a sling will damage this sling by melting. This fact and the related danger are commonly known by now. Nevertheless, there are still accidents, especially if abseiling and lowering off are interchanged. The two accidents described below emphasize this point. However, up to now it was not known how fast, i.e. after how many – or perhaps we should say how few – metres of lowering off, a sling may melt and break.

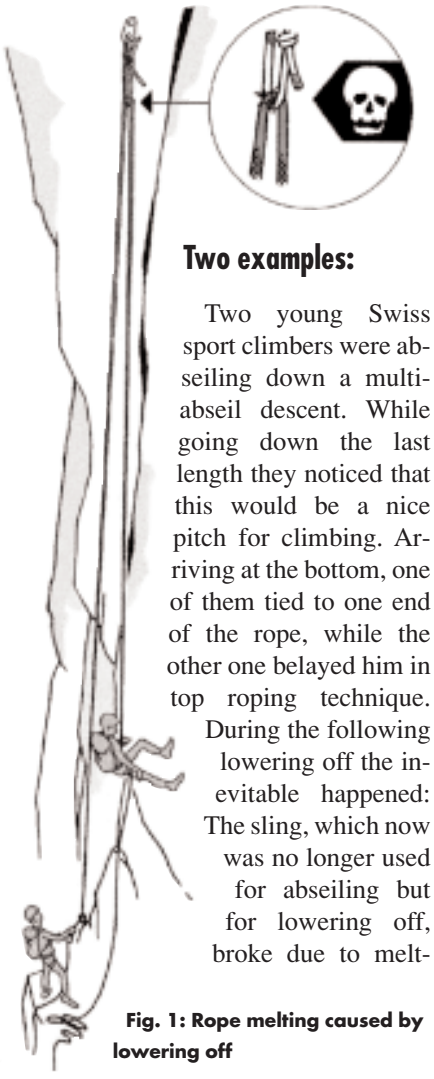

Fig. 1: Rope melting caused by lowering off

Two examples:

Two young Swiss sport climbers were abseiling down a multi-abseil descent. While going down the last length they noticed that this would be a nice pitch for climbing. Arriving at the bottom, one of them tied to one end of the rope, while the other one belayed him in top roping technique. During the following lowering off the inevitable happened: The sling, which now was no longer used for abseiling but for lowering off, broke due to melting. Taking into account the length of the fall, the injuries were only minor.

Something similar happened to two well-experienced German climbers (one of them is a mountain guide) on Grand Capucin (Montblanc). Fortunately, also in this case there were no major injuries.

An astonishing fact is that the Swiss sport climbers complained to the manufacturer of the accessory cord: they wrote to him complaining that the quality of his accessory cord had deteriorated. The manufacturer would not accept their complaint and in reply asked how they had the idea to use accessory cord for top roping and lowering off. Their answer: in the past they had been told by mountain guides that even old lengths of cord or rope can be used as slings for abseiling. That is true! But: Abseiling is not lowering off!

How many metres?

As such accidents keep on happening, I did some tests to find out how many, or how few, metres of lowering off it takes until a sling breaks by melting? We used the usual, free hanging standard weight of 80 kg. Our suspicion was proven: really, it takes only a few metres of lowering off. Using a thin rope a sling melts even faster than using a thick rope. The reason is evident: the force per unit area is bigger using a thin rope than using a thick one, and the bigger the force per unit area, the more rapidly the sling heats up in this small area, and the quicker it melts. The table at the end summarises the results.

The values hold for new accessory cords and a medium speed of lowering off. The slings might break even faster if old accessory cord is used or the

Fig. 2: Sling involved in a fatal accident

speed is higher. These values seem to be significantly lower than those known in practice. The reason may be that frequently the terrain is not quite vertical and so the slings are not loaded with the full body weight. The length of lowering off before breaking may also be significantly larger if the climber's weight is less than 80 kg, or if several slings – sometimes there is a whole bundle of them – hang at the lowering point. However, there is always danger.

The difference

The force on the sling when pulling down the rope after abseiling is quite different from the force applied when lowering off:

- Pulling down the rope (after abseiling) loads the fixed point (sling) with approximately 0.10 kN (about 10 kp) initially, but the load reduces as the rope comes free. Of course, this causes a little rope melting, but there is only slight damage to the sling and it will not break.
- The load for lowering off (top roping) may be 15 (!) times as large, i. e. up to 1.5 kN (about 150 kp). The much more rapid heating caused by such a load quickly melts the sling and causes it to break. The high pressure exerted on the sling by the rope during lowering off combined with the friction really cuts the sling by melting.

Tests concerning sling melting

sling melts after ... metres of lowering off

		9 mm half rope metres of lowering off	11.5 mm single rope metres of lowering off
5 mm cord	single sling	1.00	1.70
	doubled sling	2.00	2.20
6 mm cord	single sling	1.55	2.70
	doubled sling	2.70	3.70
7 mm cord	single sling	2.80	2.90
	doubled sling	3.90	4.10
8 mm cord	single sling	3.70	2.70 *
	doubled sling	3.60 *	4.60
10 mm cord	single sling	4.30	5.50

The values marked with an asterisk (*) deviate from the others. The reason might be the different speed of lowering off, which cannot be controlled exactly if done by hand.

Fig. 3: If a sling is used at the lowering point, the rope has to run through a karabiner with lock mechanism.

photos: P. Schubert

Fig. 4 / 5: Special bolts designed for toproping: They also make it easier to clip the rope. Fig. 4 shows the DAV "toproping bolt", Fig. 5 shows the STUBAI "IQ-bolt" developed by Heinz Zak.