

## Monte Rosa refuge, Zermatt (VS), March 20 2011 - Avalanche after dark.<sup>1</sup>

*Having missed the customary route for the final ascent to the Monte Rosa refuge, a backcountry touring group were seeking to cross a steep moraine slope in the dark. The two members leading the group triggered a wide avalanche and were overwhelmed by it. One of them was buried deep and died before being reached by rescuers.*

### Sequence of events and rescue mission

Six backcountry skiers from Germany were taking part in a week's tour without a guide. On the day of their arrival, March 19, they decided not to climb the Allalinhorn because of critical avalanche conditions (avalanche danger considerable, level 3). They instead ascended to the Britanniahütte refuge (3030 m).

At 8 am on the day of the accident, the group left the refuge for the long trek via the Strahlhorn (4190 m), Adler Pass and Stockhorn Pass to the Monte Rosa refuge. Shortly before 6 pm, they notified the warden of the Monte Rosa refuge that they expected to arrive in about an hour's time. They had assessed their position inaccurately, however, and were actually 100 m further down the mountain than they had thought.

After failing to find the normal ascent to the refuge, they selected a different route. Around an hour after darkness fell, the two persons at the front of the group began to make a trail on a very steep slope descending to the west. Due to its steep gradient, the second of the two waited at the edge of the slope. Because the slope was in the shadow of the moon, they were moving in almost utter darkness except for their headlamps. While the first man was traversing the slope, an almost 200-metre wide slab was released about 10 to 15 m above him (Fig. 1). The avalanche swept him down to the glacier. He was buried to a depth of around 2 m. The second person was likewise overwhelmed by the slab. This victim was swept along and partially buried. He was able to free himself, however, and alert the mountain rescue service. The other members of group did not know that an avalanche had been released because they were following at a distance of around 200 metres. They did not become aware of the avalanche until noticing that the ascending trail came to an end in front of them. They immediately launched a search. By the time the mountain rescuers arrived, they had roughly located the person who was buried. He was buried so deep, however, that he was not freed from the snow masses until a period of 50 minutes had elapsed (Fig. 2). Unfortunately, the victim had already died.



FIGURE 1 – Avalanche fracture, showing the backcountry skiers' route across the slope. The around 200-m wide slab fractured on the very steep west facing slope containing large blocks of rock below the Monte Rosa refuge (photo: Valais cantonal police, 21.03.2011).



FIGURE 2 – Avalanche deposit showing the place where the body was found (circled). The victim was buried beneath 2 m of snow (photo: Valais cantonal police, 21.03.2011).

### Weather and avalanche situation

Weather conditions had been variable on the days preceding the accident. Snow fell occasionally; the wind was generally light, intermittently at moderate velocity. In mid-March the bonding of the snowpack was unfavourable over a large area. On shady slopes in particular, the preceding weeks' freshly fallen snow and snow drift accumulations were deposited atop of faceted layers of snow. Other avalanches that released during this period were characterised in many cases by the snowpack fracturing at its centre; layers of fresh and drifted snow had slid over faceted layers. The avalanche that gave rise to this accident exhibited a similar sliding

1. Extract from: *Techel, F., Pielmeier, C. 2013: Schnee und Lawinen in den Schweizer Alpen. Hydrologisches Jahr 2010/11. Davos, WSL-Intitut für Schnee- und Lawinenforschung SLF, 95 S., Seiten 72 – 75, Translation: TTN Translation Network*

surface (Fig. 3).

During the night before the accident, 10 to 20 cm of snow fell in the region where it occurred. On the day of the accident the weather was sunny and the wind was light.

*Extract from the National Avalanche Bulletin for March 20 2011, valid for the region in which the accident occurred:*

– *Avalanche danger forecast: Considerable avalanche danger (level 3)*

The avalanche prone locations are to be found primarily on steep slopes of southwestern to northern to southeastern exposition, and in areas adjacent to ridgelines and pass areas in all expositions, above approximately 2200 m. The major peril stems from the new fallen snow from the last few days, together with the freshly formed snowdrift accumulations. Avalanches which attain medium size are possible. Particularly on north facing slopes, it is possible to trigger avalanches in the old snowpack. In addition, freshly formed, usually small sized snowdrift accumulations should be avoided whenever possible. For backcountry skiing and freeriding tours in all regions of the Swiss Alps, experience in the evaluation of avalanche hazards is imperative. Due to the daytime warming cycle, the likelihood of dry avalanches being triggered will escalate somewhat over the course of the day.

**Remarks**

This accident was caused by a combination of several factors.

The snow conditions were difficult; it fell to the person leading the group to find and forge a viable trail for the others, even when skiing downhill. As a consequence, the group were still on the mountain at a relatively late hour. In addition, they did not find the normal route for the ascent to the Monte Rosa refuge and descended too far. After phoning the warden of the refuge, they discussed what action to take next, but estimated their position inaccurately. Believing the direct ascent from their current

position to the refuge to be too dangerous, they planned to take a detour and ascend from the west on a route that was not usually used. As they were ascending to the west of a small lake, night fell. For that reason, both orientation and the task of assessing the terrain became increasingly difficult.

The avalanche was released on a seldom-used moraine slope containing large blocks of rock. It is likely that the bonding of the snowpack was especially unfavourable there.

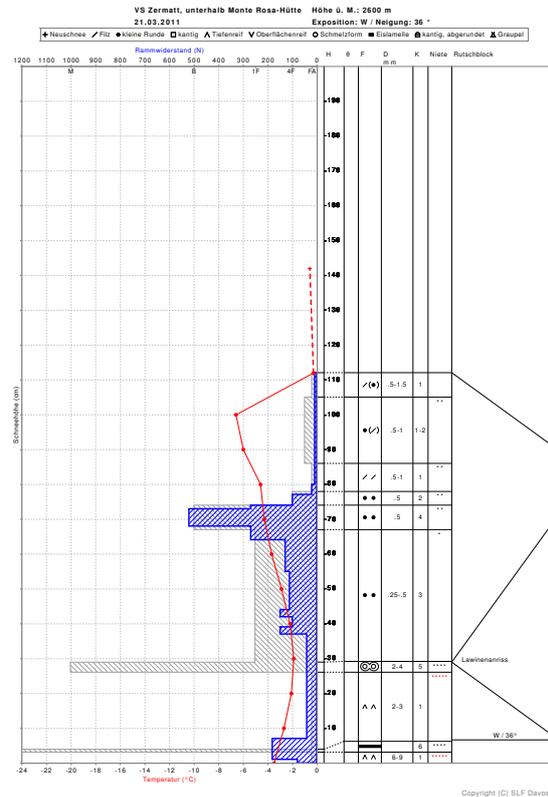


FIGURE 3 – Snow profile with rutschblock test, recorded where the avalanche fractured on the very steep west facing slope below the Monte Rosa refuge in Valais on March 21, one day after the avalanche occurred. The slope is a very rocky lateral moraine of the Grenzgletscher glacier. The avalanche slid on the crust lying at 29 cm. The hand-hardness profile is shaded pale grey, and the ram-resistance profile is shaded blue.

TABLE 1 – Weather conditions in the region where the accident occurred, as measured by manned and automatic stations. All the values were recorded at 8 am and reflect the conditions of the preceding 24-hour period (24-hour total or mean, as appropriate).

Date	Air temp. (°C) GOR1 <sup>a</sup>	mean wind strength (km/h)/direction GOR1 <sup>a</sup>	Fresh snow (cm) ZER4 <sup>b</sup>	Fresh snow (cm) 4ZO <sup>c</sup>
15.03.2011	-5	18 – SE	0	0
16.03.2011	-6	17 – NE	0	0
17.03.2011	-7	8 – SE	24	12
18.03.2011	-7	9 – S	0	0
19.03.2011	-9	7 – SE	0	6
20.03.2011	-9	8 – SE	10	4

<sup>a</sup> GOR1: ENET station Gornergrat 3130 m; distance of 3.1 km.

<sup>b</sup> ZER4: IMIS snow station Zermatt, Alp Hermetje 2380 m; distance of 8.5 km.

<sup>c</sup> 4ZO: Observer station Zermatt Ost, Eisflue 2235 m; distance of 7.1 km.

#### Avalanche data

<b>Avalanche</b>			
Map No.	1348	Min. fracture depth [cm]	–
Length [m]	170	Mean fracture depth [cm]	60
Width [m]	180	Max. fracture depth [cm]	–
<b>Terrain</b>			
Aspect	WNW	Slope angle on map [°]	37
Altitude	2630	Type of terrain	Rocky, steep terrain
<b>Release information</b>			
Release type	person	Safety distances	yes
No. of triggering persons	1	Activity	Skiing, backcountry tour, ascent
No. of involved persons	2	Tracks	no
<b>Involved person</b>		<b>Duration of burial</b>	
1 <sup>st</sup> person	<b>Injury</b> fatal	<b>Type of burial</b> fully buried	50 min.
2 <sup>nd</sup> person	uninjured	partially buried	–

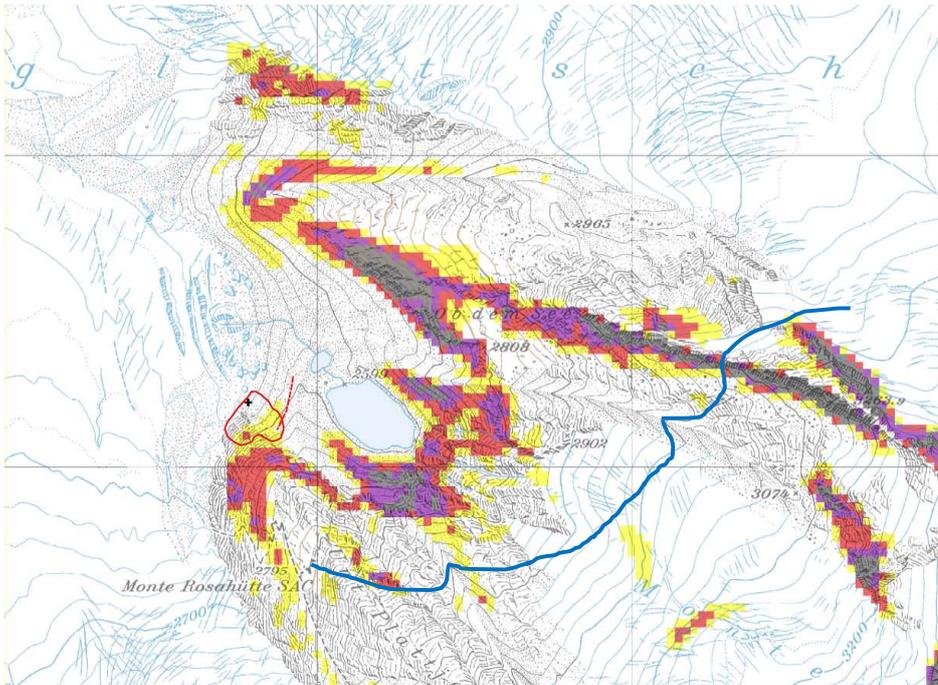


FIGURE 4 – Map section of accident site (1:25,000, national map sheet 1348) showing the outline of the avalanche (red line), the ascent trail (red broken line), and the place where the victim was found (black cross). The blue line depicts the normal route from the Gornergletscher to the Monte Rosa refuge. Map reproduced with permission from swisstopo (JA100118/JD100040).